Private Plan Change Request – Hughes Developments Limited Appendix D – Geotechnical Assessment





23 October 2020

Hughes Developments Ltd Christchurch

Attn: Kelvin Back

RE: Geotechnical Summary Letter - Faringdon Far West, Rolleston, Christchurch

(Our Reference: 12903.000.000_103)

1 Introduction

ENGEO Ltd was requested by Hughes Developments Ltd to provide a geotechnical summary letter for the property at Faringdon Far West, Rolleston, Christchurch. The purpose of the letter is to support several geotechnical reports previously completed by ENGEO. This document should be considered supplementary to the reports outlined below and the full reports should be consulted for further detail.

2 Site Description

We understand that the Faringdon Far West development is the area bordered by East Maddisons Road, Selwyn Road and Goulds Road, southwest of the existing Faringdon Development. The approximate site location is shown in Appendix 1 of this report. ENGEO has previously completed the following geotechnical reports within this site:

- 597 East Maddisons Road dated 3 September 2020.
- 92 Dunns Crossing Road dated 13 December 2020.
- 108 Dunns Crossing Road dated 8 November 2019.
- 3/144 Dunns Crossing Road dated 14 August 2020.

3 Geotechnical Investigation Summary

Our geotechnical investigations comprised of machine excavated test pits and hand augers with associated Scala penetrometer tests. The investigations revealed subsurface conditions across the site are consistent with the published geological mapping. Broadly, the subsurface conditions were topsoil overlying sandy gravel. In some testing locations, silt and sand deposits were encountered that are inferred to be in filled paleo channels where they have not remained as channel features.

Based on surrounding ECan boreholes, groundwater was typically recorded at over 5 m deep and up to approximately 10 m deep.



In none of the subsurface investigations completed to date or ECan boreholes reviewed, did we encounter any ground conditions inconsistent with the rest of the site. Therefore, based on the scope of testing completed to date, we consider that the site can be assessed as a large block with no specific areas of concern.

4 Geotechnical Recommendations Summary

Based on our site investigation and observations, and owing to the nature of the subsurface materials and depth to groundwater at the site, we consider the potential for liquefaction and lateral spreading on the site to be very low.

We therefore consider the site of the proposed subdivision to have Technical Category 1 (TC1) future land performance whereby future land damage from liquefaction unlikely, and ground settlements are expected to be within normally accepted tolerances.

Site specific testing will be required for Building Consent, to confirm the bearing materials and bearing capacity. For preliminary design, we anticipate that a geotechnical Ultimate Bearing Capacity of 300 kPa may be assumed for foundations bearing on native sandy gravel or engineered fill, below any topsoil. All topsoil shall be stripped from within building footprints.



5 Limitations

- i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Hughes Developments Ltd, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.
- ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the Client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.
- iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.
- iv. This Limitation should be read in conjunction with the Engineering NZ / ACENZ Standard Terms of Engagement.
- v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (03) 328 9012 if you require any further information.

Report prepared by

Jed Watts

Engineering Geologist

Report reviewed by

Greg Martin, CMEngNZ (PEngGeol)

Principal Engineering Geologist

Attachments:

Site plan







Christchurch

Submitted to:

Hughes Developments Ltd Christchurch

ENGEO Limited

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Figure 2: Historical Aerial Photo – 1990 - 1994

Figure 3: Nearby ECan Borehole Locations

Appendices

Appendix 1: Site Plan and Inferred Paleo Channels

Appendix 2: ENGEO Hand Auger and Test Pit Logs

Appendix 3: ECan Borelogs

ENGEO Document Control:

Report Title	Geotechnical Investigation - 3/144	Dunns Crossing R	load, Rolleston	
Project No.	12903.001.000	Doc ID	91	
Client	Hughes Developments Ltd	Client Contact	Kelvin Back	<
Distribution (PDF)	Kelvin Back			
Date	Revision Details/Status	WP	Author	Reviewer
14/08/2020	Issued to Client	JT	JRW	GM



1 Introduction

ENGEO Ltd was requested by Hughes Developments Ltd to undertake a geotechnical investigation of the property at 3/144 Dunns Crossing Road, Rolleston, Christchurch, as outlined in our variation proposal (ref: P2020.004.581_01).

The purpose of this assessment was to conceptualise a geological model of the site, assess the likely future land performance, comment on the suitability of the site for residential subdivision, address the requirements of Section 106 of the Resource Management Act (RMA) and provide recommendations for subdivision works and foundations for typical timber framed residential dwellings.

Our scope of works included the following:

- Complete a desktop study of relevant available geotechnical and geological publications, including the NZ Geotechnical and Environment Canterbury Databases;
- Undertake a geotechnical site walkover;
- Undertake five hand auger boreholes with associated Scala penetrometer tests to assess the near surface material types and strength characteristics;
- Organise and technically supervise the excavation of six test pits, including geotechnical logging of the exposed soils; and
- Preparation of this report outlining our findings on the ground conditions and the suitability
 of the site for residential subdivision, including geotechnical advice on the likely foundation
 Technical Category, conceptual foundation recommendations for typical timber framed
 residential dwellings, and address likely geohazards as required by Section 106 of the RMA.

2 Site Description

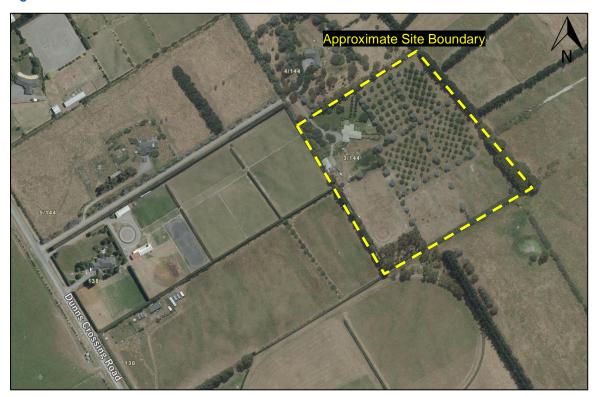
The site comprises of one property with a total area of four hectares and the following legal description (Canterbury Maps):

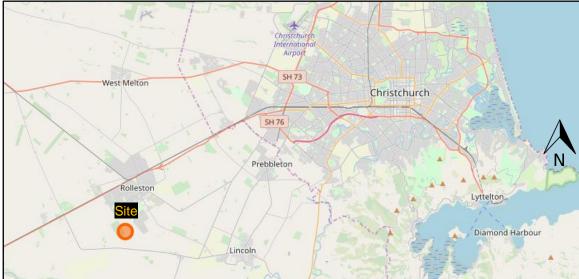
Lot 3 DP 70352 BLK III

The site is located approximately 3 km southwest of Rolleston town centre and is bound on all sides by rural properties (Figure 1).



Figure 1: Site Location Plan





 $Images\ sourced\ from\ Canterbury\ Maps\ and\ ``©\ OpenStreetMap\ contributors".\ Not\ to\ scale.$

3 Geological Model

3.1 Regional Geology

The site has been regionally mapped by GNS (Forsyth et al., 2008) as being underlain by brownish grey river alluvium (Q2a).



3.2 Geomorphology

The site comprises relatively flat ground, with gentle undulations and depressions in some areas. As evident on aerial imagery (Canterbury Maps, 2019) and observed during our site walkover conducted on 5 August 2020, undulating and depressed ground can be attributed to paleo-channels, which traverse the site in a general northwest to southeast direction (Figure 2). Based on observations, sandy silt deposits with variable thickness are expected to have in-filled the paleo-channels where they have not remained as channel features. Inferred paleo-channels have been mapped to give an indication of areas with potential channel in-fill (Appendix 1).

Approximate Site Boundary

8/0/39

Figure 2: Historical Aerial Photo - 1990 - 1994

 $\label{lem:lemage_loss} \mbox{Image sourced from Canterbury Maps. Not to scale.}$

3.3 Geohazards

3.3.1 Seismicity

There are no known or mapped faults in the immediate area of the site, however the site may be at risk of ground shaking induced by movement of proximal or distal faults.

The site is located between two recently discovered fault systems, the Greendale Fault and the Port Hills Fault, the ruptures of which initiated the ongoing Canterbury Earthquake Sequence (CES). The Greendale Fault has been mapped approximately 6 km north / northwest of the site and trends roughly east-west with a surface rupture length of approximately 28 km (GNS, 2015), while the Port Hills Fault remains unmapped as the fault did not rupture at the surface. Movement on the Port Hills Fault is believed to have extended to within 1 km to 2 km below ground surface.



Large regional areas of faulting (GNS, 2015) namely the Ashley Fault, Porters Pass - Amberley Fault Zone, and the Hope and Alpine Faults, are further afield but present a high seismic hazard to the Christchurch area due to the anticipated size of earthquakes generated. The largest of these faults is the Alpine Fault, which has a return period of 250 - 300 years and is expected to produce a M8 earthquake. The last rupture on the Alpine Fault is believed to have occurred in 1717 (Pettinga et al., 2001).

3.3.2 Liquefaction and Lateral Spreading

The site is located in an area mapped where "damaging liquefaction is unlikely" (NZGD Map CGD5140, 2012), and a "zone of very low liquefaction potential" (GNS, 2006).

3.4 Site Investigation

Site investigations to assess the shallow subsurface material types and strength characteristics were undertaken by ENGEO on 7 August 2020. Six test pits and five hand auger investigations with associated Scala Penetrometer tests were completed to a maximum depth of 2.3 m below ground level.

The investigations revealed subsurface conditions across the site are consistent with the published geological mapping, as summarised in Table 1. Hand auger and test pit logs are attached as Appendix 2 of this report.

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Table 1:	Summary	/ Ot	Subsurface	Investigations

Soil Type	Depth to Top of Layer (m)	General Layer Thickness (m)	Density / Consistency	Additional Comments
TOPSOIL	0.0	0.1 – 0.3	Stiff to Very Stiff	-
Sandy GRAVEL	0.3	Unknown	Medium Dense to Very Dense	Tightly packed and consistent across the site. A thin lens of loosely packed fine to medium gravel was encountered at approximately 1 m depth across the test pit locations.

3.5 ECan Boreholes

A review of six deep ECan borehole logs was conducted. The first (M36/4449 & M36/4387), are located on-site, and appear to be water wells providing the properties irrigation and domestic supply. The other boreholes are located to the north (M36/4450), east (M36/20535), south (BX23/0895) and west (M36/7416) of the site.

Well logs from the six holes of interest are attached to this report as Appendix 3 and summarised in Table 2.



Table 2: Generalised Summary of ECan Boreholes

ECan Borehole	Total Depth (m)	Water Level Below Ground Level (m)	Generalised Borelog as Logged by Driller
M36/5041	34	9.73	Gravel with silt and sand to 34 m depth.
M36/0016	15.2	9.85	Sandy gravel to 15.2 m depth.
M36/5042	32.5	9.97	Sandy gravel to 32.5 m depth.
M36/5038	32	9.58	Sandy gravel to 32 m depth.

Figure 3: Nearby ECan Borehole Locations



Aerial photograph sourced from Canterbury Maps. Not to scale.



3.6 Groundwater

Groundwater is recorded in the surrounding boreholes between approximately 9 to 10 m depth.

3.7 Site Seismic Class

In accordance with NZS 1170.5:2004, Class D applies to this particular site, defining it as a 'deep soft soil site'.

4 Liquefaction Analysis

Owing to the nature of the subsurface materials and depth to groundwater at the site, we consider the potential for liquefaction and lateral spreading on the site to be very low.

We therefore consider future land performance to be in line with Technical Category 1 (TC1), whereby future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances.

5 RMA Section 106 Requirements and Suitability to Subdivide

Section 106 of the Resource Management Act 1991 states a consent authority may refuse to grant a subdivision consent, or may grant a consent subject to specific consent conditions if it considers that:

- There is a significant risk from natural hazards; or
- Sufficient provision has not been made for legal or physical access to each allotment to be created by the subdivision.

An assessment of the risk from natural hazards as required by the RMA includes the following:

- The likelihood of natural hazards occurring (whether individually or in combination);
- The material damage to land in respect of which the consent is sought, other land, or structures that would result from natural hazards; and
- Any likely subsequent use of the land in respect of which the consent is sought that would accelerate, worsen, or result in material damage of the kind referred to in paragraph (b).

We have assessed the risk of natural hazards at the site in accordance with Section 106 of the Resource Management Act (RMA) and considered the risk to the site from rockfall, inundation (debris), slope stability, subsidence, flooding and tsunami. Based on our observations and the nature of the site, its performance during the CES, and the site's distance from the nearest significant watercourse, we consider it is unlikely for the site to be subject to natural hazards such as rockfall, inundation (debris), slope stability, subsidence, flooding and tsunami. As such, the site is considered suitable for subdivision from a geotechnical perspective.



6 Geotechnical Recommendations

6.1 Earthworks

Earthworks carried out for the subdivision shall be in accordance with NZS 4404:2010, Land Development and Subdivision Infrastructure and NZS 4431:1989, Code of Practice for Earth filling for Residential Development. In particular, any areas to receive fill should be stripped of all vegetation, topsoil, non-engineered fill, soft or organic soils prior to fill placement.

Fill may comprise clean natural sandy gravel or silty soils, or clean imported soils and / or granular fill, compacted to achieve no less than 95% of maximum dry density. Fill faces steeper than 2V:1H and higher than 600 mm should be retained and referred back to ENGEO. Although unlikely, where any springs or groundwater seeps are encountered, they should be intercepted with suitable drainage and discharged to a Council approved outlet.

All unretained batters of pond and stormwater drains constructed with the native sandy gravel material should be at an inclination no steeper than 1V:3H, with protection schemes in place to control erosion of the formed batters within the waterways.

A comprehensive earthworks specification should be provided to the earthworks contractor prior to starting excavations and an inspection / testing regime agreed, along with a robust erosion and sediment control plan.

6.2 Subdivision Roading

Vegetation, any organic or deleterious material, topsoil and non-engineered fill should be removed from the site under pavement areas prior to aggregate placement. Based on our observations during testing, we consider the natural ground below the topsoil at the site should provide an adequate subgrade for the proposed pavement areas.

6.3 Stormwater Control

Concentrated stormwater flows from all impermeable areas must be collected and carried in sealed pipes to the Council system or an alternative disposal point subject to approval from Council. Uncontrolled stormwater must not be allowed to saturate the ground as this will potentially affect future foundation performance both statically and during future seismic activity.

6.4 Foundations

Foundations for future proposed residential dwellings within the subdivision may comprise shallow pad, strip, or slab foundations designed in accordance with the provisions of NZS 3604 Timber Framed Buildings.

Site specific testing will be required for Building Consent, to confirm the bearing materials and capacity. For preliminary design, we anticipate that a geotechnical Ultimate Bearing Capacity of 300 kPa may be assumed for foundations bearing on sandy gravel or engineered fill, below any topsoil. All topsoil shall be stripped from within building footprints, we anticipate this to be typically below 0.3 m depth based on our subsurface investigations.



7 References

- Canterbury Maps, Groundwater. Retrieved August 2020, from http://canterburymaps.govt.nz/Viewer.
- Canterbury Maps, Historic Aerial Imagery. Retrieved August 2020, from https://apps.canterburymaps.govt.nz/CanterburyHistoricAerialImagery.
- Forsyth, P., Barrell, D. J., & Jongens, R. (2008). Sheet 16 Geology of the Christchurch Area 1:250,000. Lower Hutt: Institute of Geological and Nuclear Sciences.
- GNS Science (2015). New Zealand Active Faults Database. Retrieved August 2020, from http://data.gns.cri.nz /af.
- Pettinga J.R., Yetton M.D., Van Dissen R.J., & Downes G. (2001). Earthquake Source Identification and Characterisation for the Canterbury Region, South Island, New Zealand. Bulletin of the New Zealand Society for Earthquake Engineering, Vol 34, No. 4, pp 282-317.
- Selwyn District Council, Property Search, retrieved August 2020, from https://www.selwyn.govt.nz/my-property/rates/search-properties.
- Standards Association of New Zealand (1989). NZS 4431:1989. Code of Practice for Earthfilling for Residential Development.
- Standards Association of New Zealand (2004). NZS 1170.5:2004. Structural Design Actions Part 5: Earthquake Actions New Zealand.
- Standards Association of New Zealand (2010). NZS 3604:2010. Timber Framed Buildings.
- Standards Association of New Zealand (2010). NZS 4404:2010. Land Development and Subdivision Infrastructure.
- The Ministry of Business, Innovation, and Employment (2016). New Zealand Geotechnical Database. Retrieved August 2020, from https://www.nzgd.org.nz.



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We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (03) 328 9012 if you require any further information.

Report prepared by

Jed Watts

Engineering Geologist

Report reviewed by

Greg Martin, CMEngNZ (PEngGeol)

Principal Engineering Geologist

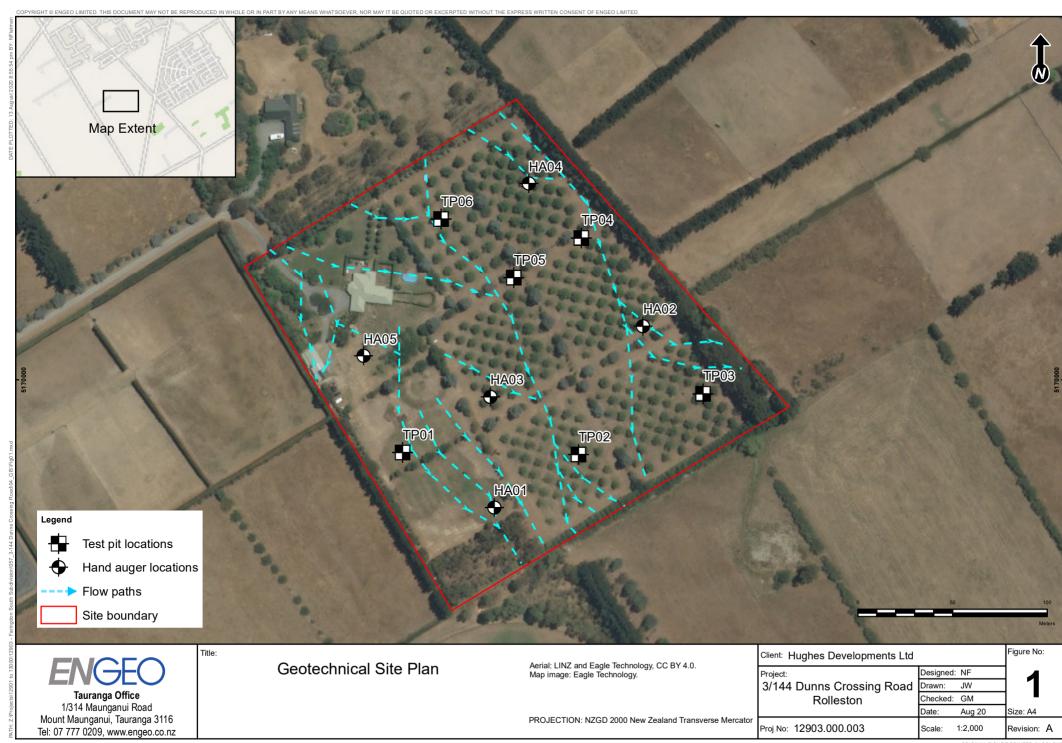




APPENDIX 1:

Site Plan and Inferred Paleo Channels







APPENDIX 2:

ENGEO Hand Auger and Test Pit Logs

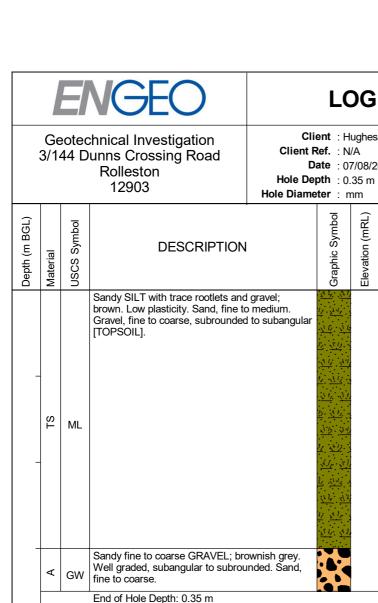




Geotechnical Investigation 3/144 Dunns Crossing Road Rolleston 12903

Shear Vane No : N/A Client: Hughes Developments Ltd Client Ref. : N/A Logged By : JC Date : 07/08/2020 Reviewed By: JW Hole Depth: 0.4 m Latitude: 172.3744

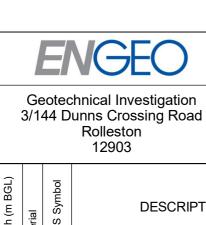
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Shear Vane No : N/A Logged By : JC Reviewed By: JW

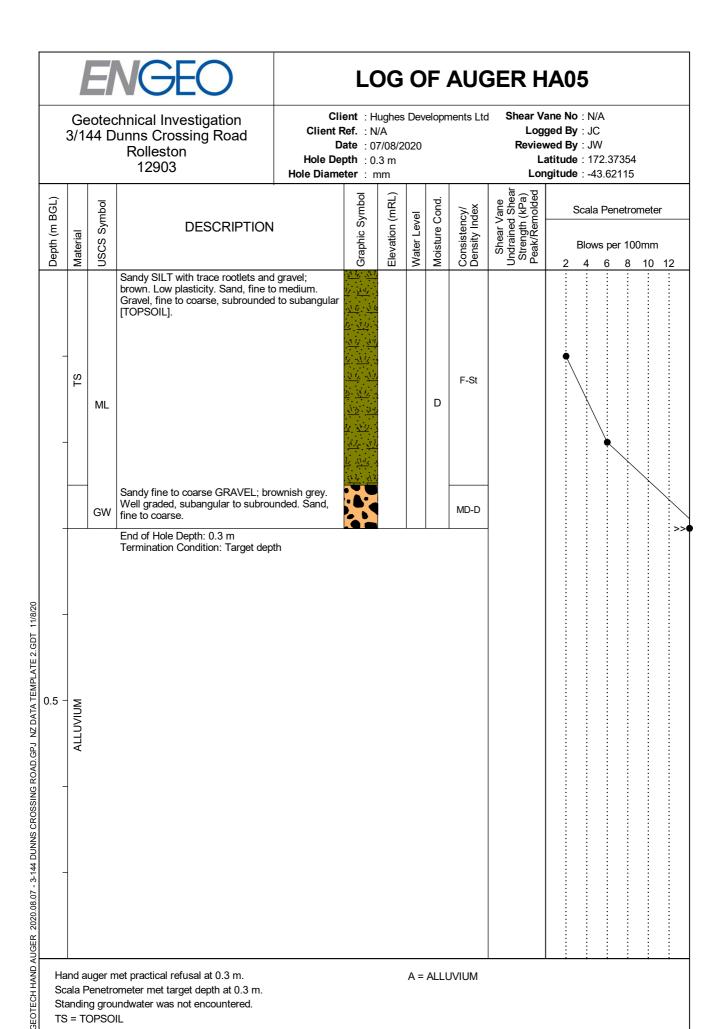
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Hand auger met practical refusal at 0.3 m. Scala Penetrometer met target depth at 0.3 m. Standing groundwater was not encountered. TS = TOPSOIL



Geotechnical Investigation 3/144 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A **Date**: 07/08/2020 Logged By : JC Max Test Pit Depth: 2.3 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: 172.37377 Bucket Type/Size : Bucket Excavator Longitude : -43.62161

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Geotechnical Investigation 3/144 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A **Date**: 07/08/2020 Logged By : JC Max Test Pit Depth : 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: 172.37494 **Longitude**: -43.62163 Bucket Type/Size : Bucket Excavator

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		ш		I	⊃ ML	Sandy SILT with minor gravel and brown. Low plasticity. Sand, fine to coarse. Gravel, fine to medium, subrounded to subangular [TOPSC)	D \[\frac{1}{2}	<u> </u>	>	M	St-VSt	ш	2	4	6	8	10 1	<u>2</u> : : : :
0.5 -					GW	Sandy fine to coarse GRAVEL with cobbles; brownish grey. Well grade subangular to subrounded. Sand, f coarse.	ed,	K K K			D	Tightly Packed							
1.0	LUVIUM				SW	Gravelly fine to coarse SAND; grey graded. Gravel, fine to coarse. Sandy fine to coarse GRAVEL with cobbles; brownish grey. Well grade subangular to subrounded. Sand, f coarse. 100 mm to 150 mm lens of loosely	n minor ed, fine to					MD-D							
1.5 -	H A				GW	packed fine to medium gravel encountered at 1 m depth.					M	Tightly Packed							
2.0						Depth of Excavation: 2 m Termination Condition: Target dept	th	X											
2.5																			<u>:</u>
Test p	oit r	met tar	rget d	lepth	-														_
Standi	ing	grour	ndwat	er w	as not	encountered.	TS:	= TOPS	SOIL										



Geotechnical Investigation 3/144 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A **Date**: 07/08/2020 Logged By : JC Max Test Pit Depth: 2.1 m Reviewed By: JW

Digger Type/Size : 24 Tonne **Latitude**: 172.37575 **Longitude**: -43.62133 Bucket Type/Size : Bucket Excavator

						Bucket Type/Size . B	ucket L	λωαναι	LOI			Longitude	, . - -	0.02	- 100			
Depth (m BGL)	Material	Easier (Relaf)	avatab tive S	Harder (elbo	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)				r 10	ometo	n
_	TS				ML	Sandy SILT with minor gravel and rootlets; brown. Low plasticity. Sand, fine to coarse. Gravel, fine to coarse, subrounded to subangular [TOPSOIL].	1. 37.17 1. 37.17 31.18 37			D	St-VSt							
0.5 -						Sandy fine to coarse GRAVEL with minor cobbles; brownish grey. Well graded, subangular to subrounded. Sand, fine to coarse. Trace silt encountered from 0.3 to 0.5 m depth.	NO.											
1.0—	ALLUVIUM				GW	100 mm lens of loosely packed fine to medium gravel encountered at 1.2 m depth.				М	Tightly packed							
2.0						Depth of Excavation: 2.1 m Termination Condition: Target depth												
- - 2.5													:		:			
	t nit	met ta	raet a	denth														_



Geotechnical Investigation 3/144 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A **Date**: 07/08/2020 Logged By : JC Max Test Pit Depth: 2.3 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: 172.37497 Longitude : -43.62056 Bucket Type/Size : Bucket Excavator

Sandy SILT with some gravel and trace rootlets; brown. Low plasticity. Sand, fine to coarse, subrounded to subangular [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbies; brownish grey. Well graded, subangular to subrounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth. 1.0— - MIND WIND WIND WIND WIND WIND WIND WIND W								Bucket Type/Size :	Bucket E	xcava	tor			Longitude	: -4	3.02	056		
Sandy Sitt with some gravel and frace recollests brown. One plasicity. Sand, file to medium. Gravel, fine to coarse, subcouncided to subrounded to subrounde	Depth (m BGL)	Material	(Relat	avatal tive S	Scale)	USCS Symbol	DESC			Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	В	ows	per	100	mm
cobbles; brownish grey, Well graded, Sand, fine to coarse. Rootlets encountered up to 0.6 m depth. 4100 mm lens of loosely packed fine to medium gravel encountered at 1.2 m depth. Depth of Excavation: 2.3 m Termination Condition: Target depth Test pit met target depth. Test pit met target depth.	_						∣ to medium. Grave	I, fine to coarse,	11 - 31-12			D						:	
Test pit met target depth.	0.5 -						cobbles; brownish subangular to sub	grev. Well graded.											
Comparison of loosely packed fine to medium gravel encountered at 1.2 m depth. Depth of Excavation: 2.3 m Termination Condition: Target depth Tightly Packed	_						Rootlets encounte	red up to 0.6 m depth.											
Depth of Excavation: 2.3 m Termination Condition: Target depth 2.5 Test pit met target depth. TS = TOPSOIL	1.0-	5																	
Depth of Excavation: 2.3 m Termination Condition: Target depth 2.5 Test pit met target depth. TS = TOPSOIL	- 15-	ALLUVIUN				GW	medium gravel en	loosely packed fine to countered at 1.2 m				М							
Depth of Excavation: 2.3 m Termination Condition: Target depth 2.5 Test pit met target depth. TS = TOPSOIL																			
Test pit met target depth. Test pit met target depth. Test pit met target depth.	2.0																		
TS = TOPSOIL	- - -						Depth of Excavation	on: 2.3 m ition: Target depth	文										
TS = TOPSOIL	2.5														•	<u>:</u>	<u>:</u>	<u>:</u>	
TS = TOPSOIL																			
TS = TOPSOIL																			
TS = TOPSOIL																			
TS = TOPSOIL																			
								TS	S = TOPS	SOIL									



Geotechnical Investigation 3/144 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A **Date**: 07/08/2020 Logged By : JC Max Test Pit Depth : 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: 172.37453 **Longitude**: -43.62077 Bucket Type/Size : Bucket Excavator

1						Bucket Type/Size . B										
Depth (m BGL)	Material	Easier (Relat	vatabi ive Sc	Harder (alex	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)		r 100	mete 0mm 10 1:	
-	TS				ML	Sandy SILT with some gravel and trace rootlets; brown. Low plasticity. Sand, fine to medium. Gravel, fine to coarse, subrounded to subangular [TOPSOIL].	11. 3. 11. 3. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.			D	St-VSt					-
0.5 -						Sandy fine to coarse GRAVEL with minor cobbles; brownish grey. Well graded, subangular to subrounded. Sand, fine to coarse. Trace silt encountered from 0.3 to 0.6 m	S S S S S S S S S S S S S S S S S S S									
- -						depth. 200 to 300 mm lens of loosely packed fine to medium gravel encountered at 0.7 m depth.										
1.0— - -	ALLUVIUM				GW		XX			М	Tightly Packed					
- 1.5 - -	-															
_ _ _ _	-															
2.0			•	-		Depth of Excavation: 2 m Termination Condition: Target depth										
- 2.5	-															



Geotechnical Investigation 3/144 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A **Date**: 07/08/2020 Logged By : JC Max Test Pit Depth : 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: 172.37404 Longitude : -43.62051 Bucket Type/Size : Bucket Excavator

						Bucket Type/Size .											
Depth (m BGL)	Material	Easier (Relat	vatabi ive Sc	Harder (əlɛː	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)			r 10	mete 0mm	n
_	TS				ML	Sandy SILT with some gravel and trace rootlets; brown. Low plasticity. Sand, fine to medium. Gravel, fine to coarse, subrounded to subangular [TOPSOIL].	1/. 21.1/ 1/. 21.1/ 2.1/. 21.1/			D	St-VSt						
0.5 -						Sandy fine to coarse GRAVEL with minor cobbles; brownish grey. Well graded, subangular to subrounded. Sand, fine to coarse. Trace silt encountered from 0.3 to 0.6 m depth.											
1.0-	ALLUVIUM				GW	100 mm lens of loosely packed fine to				М	Tightly Packed						
1.5 -						medium gravel encountered at 1.3 m depth.											
2.0						Depth of Excavation: 2 m Termination Condition: Target depth	\mathfrak{A}										
- - -						ů .											
2.5													<u>:</u>	 -	•	-	<u>:</u>
ļ																	



APPENDIX 3:

ECan Borelogs



Bore or Well No	M36/5041		
Well Name	DUNNS CROSSING ROAD		
Owner	KAJENS TRADING DEVELOPMENT LTD		



Well Number	M36/5041	File Number	CO6C/10302
Owner	KAJENS TRADING DEVELOPMENT LTD	Well Status	Active (exist, present)
Street/Road	DUNNS CROSSING ROAD	NZTM Grid Reference	BX23:49507-69990
Locality	ROLLESTON	NZTM X and Y	1549507 - 5169990
Location Description		Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Domestic Supply,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	32.00m	Water Level Count	0
Diameter	150mm	Initial Water Level	6.80m below MP
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	40.47m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	10	Calc Min 80%	9.73m below MP (Estimated)
Aquifer Name		Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	01 Feb 1997	Max Tested Yield	5 l/s
Driller	Dynes Road Drilling	Drawdown at Max Tested Yield	13 m
Drilling Method	Cable Tool	Specific Capacity	0.40 l/s/m
Casing Material	STEEL	Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	30	32				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
01 Feb 1997	1	5.1	67.31074	12.8	2

No comments for this well

Borelog for well M36/5041

Grid Reference (NZTM): 1549508 mE, 5169991 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 40.5 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 34.0 m Drill Date: 01-Feb-1997



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
		2.00m	0.0.0.0.0.0	Small medium gravel very sandy	
		_	000000000 000000000 000000000	Small medium gravel siltbound	
5		5.40m _	000000000	Small medium gravel sand	
10		8.19m _	000000000 0000000000000000000000000000	Small medium gravel siltbound, tight	
		12.80m	000000000		
15		-	000000000 000000000 000000000	Small medium gravel silt wash gravel brown	
		16.79m _	00000000	Smalll medium gravel sand traces of yellow silt	
20		21.00m _	0.0.0.0.0	Small medium gravel sandy driving	
25			0.0.0.0.0 0.0.0.0.0 0.0.0.0.0 0.0.0.0.0		
		25.40m _	**************************************	Small medium gravel traces silt water	
30		30.00m	0.00.00.00	Small medium gravel gravel small almost sand	
		34.00m _	<u> </u>	Small gravel siltboundwater dropping off	

Bore or Well No	M36/0016
Well Name	Goulds Road
Owner	WADE.A.



Well Number	M36/0016	File Number	
Owner	WADE.A.	Well Status	Not Used
Street/Road	Goulds Road	NZTM Grid Reference	BX23:49707-70190
Locality	ROLLESTON	NZTM X and Y	1549707 - 5170190
Location Description		Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	14.00m	Water Level Count	0
Diameter	51mm	Initial Water Level	
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	40.62m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	3	Calc Min 80%	9.85m below MP (Estimated)
Aquifer Name		Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	0
Drill Date	29 Aug 1932	Max Tested Yield	
Driller	Pearson	Drawdown at Max Tested Yield	
Drilling Method	Unknown	Specific Capacity	
Casing Material	STEEL	Last Updated	06 Mar 2001
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

No screen data for this well

No step tests for this well

No comments for this well

Borelog for well M36/0016

Grid Reference (NZTM): 1549708 mE, 5170191 mN

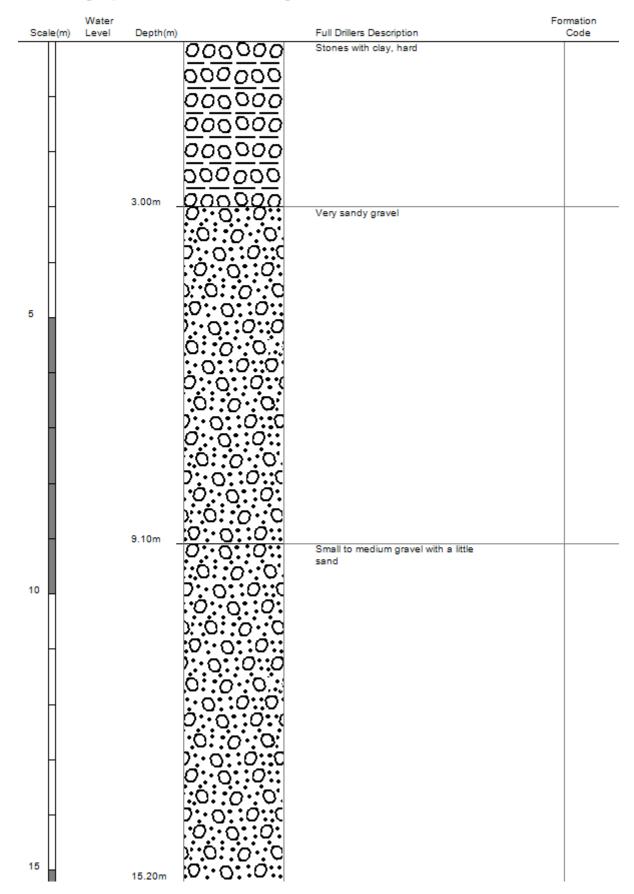
Location Accuracy: 50 - 300m

Ground Level Altitude: 40.6 m +MSD Accuracy: < 2.5 m

Driller: Pearson Drill Method: Unknown

Borelog Depth: 15.2 m Drill Date: 29-Aug-1932





Bore or Well No	M36/5042
Well Name	DUNNS CROSSING ROAD
Owner	KAJENS TRADING DEVELOPMENT LTD



Well Number	M36/5042	File Number	CO6C/10303
Owner	KAJENS TRADING DEVELOPMENT LTD	Well Status	Active (exist, present)
Street/Road	DUNNS CROSSING ROAD	NZTM Grid Reference	BX23:49378-70190
Locality	ROLLESTION	NZTM X and Y	1549378 - 5170190
Location Description		Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Domestic Supply,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	32.10m	Water Level Count	0
Diameter	150mm	Initial Water Level	6.00m below MP
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	42.04m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	8	Calc Min 80%	9.97m below MP (Estimated)
Aquifer Name		Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	01 Nov 1996	Max Tested Yield	5 l/s
Driller	Dynes Road Drilling	Drawdown at Max Tested Yield	12 m
Drilling Method	Cable Tool	Specific Capacity	0.41 l/s/m
Casing Material	STEEL	Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	30.1	32.1				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
01 Nov 1996	1	5	65.99092	12.2	2

No comments for this well

Borelog for well M36/5042

Grid Reference (NZTM): 1549378 mE, 5170191 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 42.0 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 32.5 m Drill Date: 01-Nov-1996



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
5		4.00m _	000000000 000000000 000000000 00000000	Small gravel siltbound Small medium gravel sandy	
10		12.00m	000 .000 000 .000	Small medium gravel,sandy, wet yellow silt	
	1		000000000 0000000000000000000000000000	Small medium gravel siltbound very tight	
15			0:.0::0:. :.0::0::0 0:.0::0:.0 :.0::0::0	Small medium gravel sandy siltenough water to keep sand pump going	
20	2	22.00m	:.0::0::0 0::0::0::0 :.0::0::0		
			0.0.0.0.0.0 0.0.0.0.0 0.0.0.0.0	Small medium gravel sandy	
25	2	27.60m	00000000000000000000000000000000000000	Small medium gravel brown stain clean	
30			00000000000000000000000000000000000000	Small medium gravel	

Bore or Well No	M36/5038
Well Name	DUNNS CROSSING ROAD
Owner	KAJENS TRADING DEVELOPMENT LTD



Well Number	M36/5038	File Number	CO6C/10010
Owner	KAJENS TRADING DEVELOPMENT LTD	Well Status	Active (exist, present)
Street/Road	DUNNS CROSSING ROAD	NZTM Grid Reference	BX23:49278-69840
Locality	ROLLESTON	NZTM X and Y	1549278 - 5169840
Location Description		Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Domestic Supply,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	32.10m	Water Level Count	0
Diameter	150mm	Initial Water Level	6.30m below MP
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	40.38m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	7	Calc Min 80%	9.58m below MP (Estimated)
Aquifer Name		Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	01 Nov 1996	Max Tested Yield	24 l/s
Driller	Dynes Road Drilling	Drawdown at Max Tested Yield	9 m
Drilling Method	Cable Tool	Specific Capacity	2.84 l/s/m
Casing Material	STEEL	Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	30.1	32.1				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
01 Nov 1996	1	24.1	318.076233	8.5	2

No comments for this well

Borelog for well M36/5038

Grid Reference (NZTM): 1549278 mE, 5169841 mN

Location Accuracy: 50 - 300m

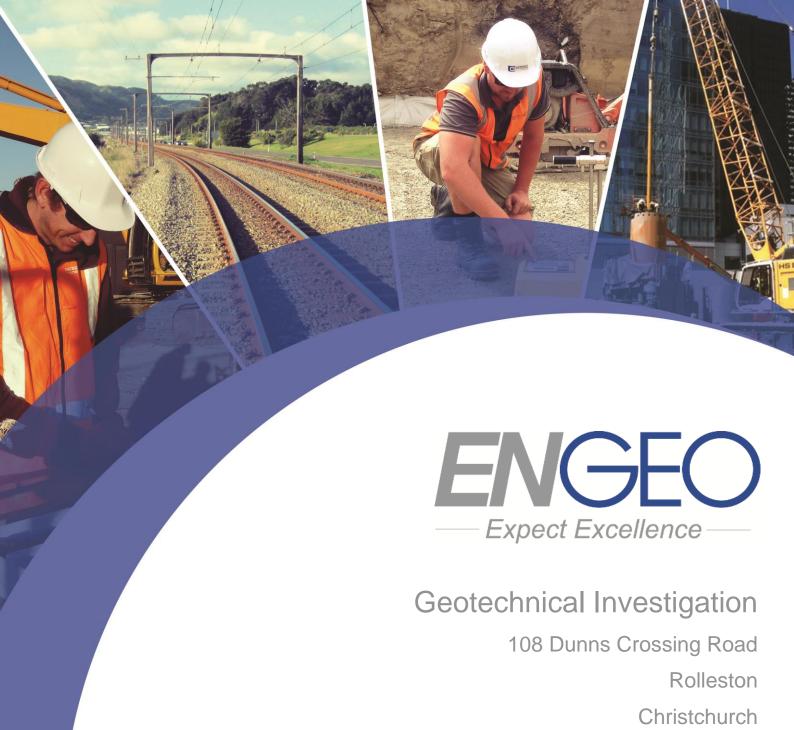
Ground Level Altitude: 40.4 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 32.0 m Drill Date: 01-Nov-1996



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
			0==0==0== 0==0==0	Small gravel silt bound	
H			0=0=0=0		
H			0==0==0==		
5	4	.00m _	5.0.0.0.0.	small medium gravel sandy	
			0.0.0.0.0.0 0.0.0.0.0		
			· · · · · · · · · · · · · · · · · · ·		
H	8	.39m _	0.0.0.0.0	Carell and diversional with west valley.	
Н			000000000	Small medium gravel with wet yellow silt, small amount of water	
10			00000000		
Ц			000000000		
	1	2.00m	0000000000		
			000000000	Small medium gravel siltboundvery tight	
П			500000000		
Н	1	4.40m _	<u>898989898</u>	Small medium gravel, sandyenough	
15			0.0.0.0.0	water to keep hand pump going.	
н			• 0 • 0 • 0 • 0 • 0		
н					
- 1			• • • • • • • • • • • • • • • • • • • •		
ш			0.0.0.0.0		
20			·······		
			0.0.0.0.0		
П	2		0.0.0.0.0		
Н	-	_	0.0.0.0.0	Small medium gravel sandy	
Н			• • • • • • • •		
Н	2	4.20m _	000000000	Small medium gravel brown stain clean	
25			000000000	Shar nedani graver blown stani dean	
- 1			000000000		
Ш			000000000		
			000000000		
			000000000		
1			500000000		
30			000000000		
Н			000000000		
	3	2.00m	ก็		



Submitted to:

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Christchurch

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Tables

Table 1: Summary of Subsurface Conditions

Table 2: Generalised Summary of ECan Boreholes

Figures

Figure 1: Site Location Plan

Figure 2: Historical Aerial Imagery – 1990 to 1994

Figure 3: Nearby ECan Borehole Locations

Appendices

Appendix 1: Site Plan and Inferred Paleo Channels

Appendix 2: ENGEO Hand Auger and Test Pit Logs

Appendix 3: ECan Boreholes

ENGEO Document Control:

Report Title	Geotechnical Investigation - 108 Dunns Crossing Road, Rolleston					
Project No.	12903.000.000 Doc ID 70					
Client	Hughes Developments Ltd Client Contact Kelvin Black					
Distribution (PDF)	Kelvin Black					
Date	Revision Details/Status	WP	Author	Reviewer		
08/11/2019	Issued to Client	JB	KF	GM		



1 Introduction

ENGEO Ltd was requested by Hughes Developments Ltd to undertake a geotechnical investigation of the property at 108 Dunns Crossing Road, Rolleston, Christchurch, as outlined in our variation proposal (ref: P2019.002.259_01).

The purpose of this assessment was to conceptualise a geological model of the site, assess the likely future land performance, comment on the suitability of the site for residential subdivision, address the requirements of Section 106 of the Resource Management Act (RMA) and provide recommendations for subdivision works and foundations for typical timber framed residential dwellings.

Our scope of works included the following:

- Complete a desktop study of relevant available geotechnical and geological publications, including the NZ Geotechnical and Environment Canterbury Databases;
- Undertake a geotechnical site walkover;
- Undertake sixteen hand auger boreholes with associated Scala penetrometer tests to assess the near surface material types and strength characteristics;
- Organise and technically supervise the excavation of fourteen test pits, including geotechnical logging of the exposed soils; and
- Preparation of this report outlining our findings on the ground conditions and the suitability of
 the site for residential subdivision, including geotechnical advice on the likely foundation
 Technical Category, conceptual foundation recommendations for typical timber framed
 residential dwellings, and address likely geohazards as required by Section 106 of the RMA.

2 Site Description

The site covers a total area of 10.1 ha and has the following legal description (Canterbury Maps):

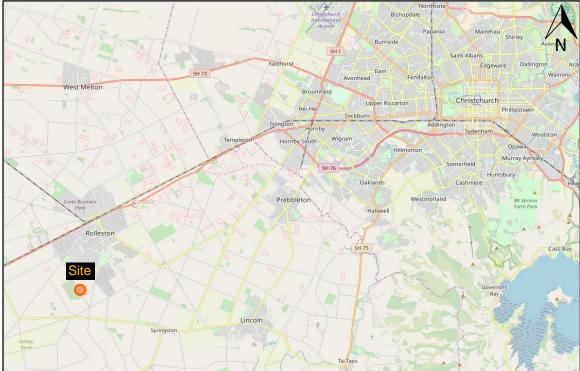
108 Dunns Crossing Road - Lot 2 DP 61278.

It is located approximately 3 km southwest of Rolleston town centre. The site is bound to the southwest by Dunns Crossing Road, and all other sides by rural properties (Figure 1).



Figure 1: Site Location Plan





Images sourced from Canterbury Maps and "@ OpenStreetMap contributors". Not to scale.



3 Geological Model

3.1 Regional Geology

The site has been regionally mapped by GNS (Forsyth et al., 2008) as being underlain by brownish grey river alluvium (Q2a).

3.2 Geomorphology

The site comprises relatively flat ground, with gentle undulations and depressions in some areas. As evident on aerial imagery (Canterbury Maps, 2019) and observed during our site walkover conducted on 4 November 2019, undulating and depressed ground can be attributed to paleo-channels, which traverse the site in a general northwest to southeast trend (Figure 2). Based on observations, silty sand deposits with variable thickness (up to 0.8 m) are expected to have in-filled the paleo-channels where they have not remained as channel features. Inferred paleo-channels have been mapped to give an indication of areas with potential channel in-fill (Appendix 1).

Figure 2: Historical Aerial Imagery – 1990 to 1994

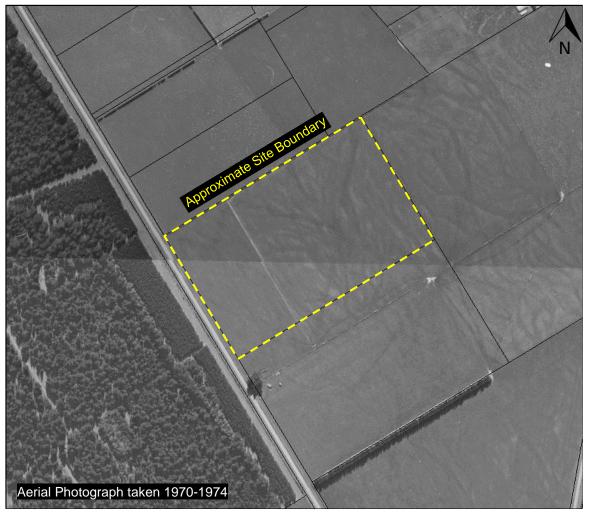


Image sourced from Canterbury Maps. Not to scale.



3.3 Geohazards

3.3.1 Seismicity

There are no known or mapped faults in the immediate area of the site, however the site may be at risk of ground shaking induced by movement of proximal or distal faults.

The site is located between two recently discovered fault systems, the Greendale Fault and the Port Hills Fault, the ruptures of which initiated the ongoing Canterbury Earthquake Sequence (CES). The Greendale Fault has been mapped approximately 5.6 km north / northwest of the site and trends roughly east-west with a surface rupture length of approximately 28 km (GNS, 2015), while the Port Hills Fault remains unmapped as the fault did not rupture at the surface. Movement on the Port Hills Fault is believed to have extended to within 1 km to 2 km below ground surface.

Large regional areas of faulting (GNS, 2015) namely the Ashley Fault, Porters Pass - Amberley Fault Zone, and the Hope and Alpine Faults, are further afield but present a high seismic hazard to the Christchurch area due to the anticipated size of earthquakes generated. The largest of these faults is the Alpine Fault, which has a return period of 250 - 300 years and is expected to produce a M8 earthquake. The last rupture on the Alpine Fault is believed to have occurred in 1717 (Pettinga et al., 2001).

3.3.2 Liquefaction and Lateral Spreading

The site is located in an area mapped where "damaging liquefaction is unlikely" (NZGD Map CGD5140, 2012), and a "zone of very low liquefaction potential" (GNS, 2006).

3.4 Site Investigation

Site investigations to assess the shallow subsurface material types and strength characteristics were undertaken by ENGEO on 4 November 2019. The investigations comprised sixteen hand auger boreholes and fourteen test pit investigations with associated Scala penetrometer tests.

The investigations revealed subsurface conditions across the site are consistent with the published geological mapping, as summarised in Table 1. Hand auger and test pit logs are included in Appendix 2 of this report.

Table 1: Summary of Subsurface Conditions

Soil Type	Depth to Top of Layer (m)	General Layer Thickness (m)	Density / Consistency	Additional Comments
TOPSOIL	0.0	0.1 – 0.3	Soft to Firm	-
Silty SAND	0.2	0.7 – 0.8	Loose to Dense	Present in TP09 and TP11
Sandy Gravel	0.1 – 1.0	Unknown	Medium Dense to Very Dense	Consistent across the site



3.5 ECan Boreholes

A review of four deep ECan borehole logs was conducted. The first (M36/4450), is located on-site, and appears to be a water well servicing the properties irrigation. The other boreholes are located to the north (M36/5038), north east (M36/5041) and south (M36/4449) of the site. A borehole is located west of Dunns Crossing Road (M36/8130) but has no borehole data for the first 54 m of the soil profile on Canterbury Maps (Figure 3)

Well logs from the four holes of interest are presented in Appendix 3 and summarised in Table 2.

Table 2: Generalised Summary of ECan Boreholes

ECan Borehole	Total Depth (m)	Water level (m)	Generalised borelog as logged by driller
M36/4449	24	7.7	Gravel to 24 m with a layer of clay from 12 to 14 m and sandy gravel from 14 to 18 m.
M36/4450	26	8.1	Gravel to 26 m with a layer of clay from 12 to 18 m, 22 to 24 m and 26 o 26.5 m.
M36/5038	32	8.5	Silt bound gravel to 4 m and gravel to 32 m with a layer of silty gravel 12 to 14.4 m.
M36/5041	34	8.6	Gravel to 34 m with layers of silt bound gravel from 2 to 5.4 m and 8.2 to 12.8 m.





Figure 3: Nearby ECan Borehole Locations

Aerial photograph sourced from Canterbury Maps. Not to scale.

3.6 Groundwater

Groundwater is recorded in the surrounding boreholes between approximately 7.7 m and 8.6 m depth.

3.7 Site Seismic Class

In accordance with NZS 1170.5:2004, Class D applies to this particular site, defining it as a 'deep soft soil site'.

4 Liquefaction Assessment

Owing to the nature of the subsurface materials and depth to groundwater at the site, we consider the potential for liquefaction and lateral spreading on the site to be very low.

We therefore consider future land performance to be in line with Technical Category 1 (TC1), whereby future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances.



5 RMA Section 106 Requirements and Suitability to Subdivide

Section 106 of the Resource Management Act 1991 states a consent authority may refuse to grant a subdivision consent, or may grant a consent subject to specific consent conditions if it considers that:

- There is a significant risk from natural hazards; or
- Sufficient provision has not been made for legal or physical access to each allotment to be created by the subdivision.

An assessment of the risk from natural hazards as required by the RMA includes the following:

- The likelihood of natural hazards occurring (whether individually or in combination);
- The material damage to land in respect of which the consent is sought, other land, or structures that would result from natural hazards; and
- Any likely subsequent use of the land in respect of which the consent is sought that would accelerate, worsen, or result in material damage of the kind referred to in paragraph (b).

We have assessed the risk of natural hazards at the site in accordance with Section 106 of the Resource Management Act (RMA) and considered the risk to the site from rockfall, inundation (debris), slope stability, subsidence, flooding and tsunami. Based on our observations and the nature of the site, its performance during the CES, and the site's distance from the nearest significant watercourse, we consider it is unlikely for the site to be subject to natural hazards such as rockfall, inundation (debris), slope stability, subsidence, flooding and tsunami. As such, the site is considered suitable for subdivision from a geotechnical perspective.

6 Geotechnical Recommendations

6.1 Earthworks

Earthworks carried out for the subdivision shall be in accordance with NZS 4404:2010, Land Development and Subdivision Infrastructure and NZS 4431:1989, Code of Practice for Earth filling for Residential Development. In particular, any areas to receive fill should be stripped of all vegetation, topsoil, non-engineered fill, soft or organic soils prior to fill placement.

Fill may comprise clean natural sandy gravel or silty soils, or clean imported soils and / or granular fill, compacted to achieve no less than 95% of maximum dry density. Fill faces steeper than 2V:1H and higher than 600 mm should be retained and referred back to ENGEO. Although unlikely, where any springs or groundwater seeps are encountered, they should be intercepted with suitable drainage and discharged to a Council approved outlet.

All unretained batters of pond and stormwater drains constructed with the native sandy gravel material should be at an inclination no steeper than 1V:3H, with protection schemes in place to control erosion of the formed batters within the waterways.

A comprehensive earthworks specification should be provided to the earthworks contractor prior to starting excavations and an inspection / testing regime agreed, along with a robust erosion and sediment control plan.



6.2 Subdivision Roading

Vegetation, any organic or deleterious material, topsoil and non-engineered fill should be removed from the site under pavement areas prior to aggregate placement. Based on our observations during testing, we consider the natural ground below the topsoil at the site should provide an adequate subgrade for the proposed pavement areas.

6.3 Stormwater Control

Concentrated stormwater flows from all impermeable areas must be collected and carried in sealed pipes to the Council system or an alternative disposal point subject to approval from Council. Uncontrolled stormwater must not be allowed to saturate the ground as this will potentially affect future foundation performance both statically and during future seismic activity.

6.4 Foundations

Foundations for future proposed residential dwellings within the subdivision may comprise shallow pad, strip, or slab foundations designed in accordance with the provisions of NZS 3604 Timber Framed Buildings.

Site specific testing will be required for Building Consent, to confirm the bearing materials and capacity. For preliminary design, we anticipate that a geotechnical Ultimate Bearing Capacity of 300 kPa may be assumed for foundations bearing on sandy gravel or engineered fill, below any topsoil. We anticipate this to be typically below 0.3 m depth based on our subsurface investigations.



7 References

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- The Ministry of Business, Innovation, and Employment (2016). New Zealand Geotechnical Database. Retrieved November 2019, from https://www.nzgd.org.nz.



8 Limitations

- i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Hughes Developments Ltd, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.
- ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.
- iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.
- iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.
- v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (03) 328 9012 if you require any further information.

Report prepared by

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Engineering Geologist

Jed Watts

Engineering Geologist

Report reviewed by

Greg Martin, CMEngNZ (PEngGeol)

Principal Engineering Geologist

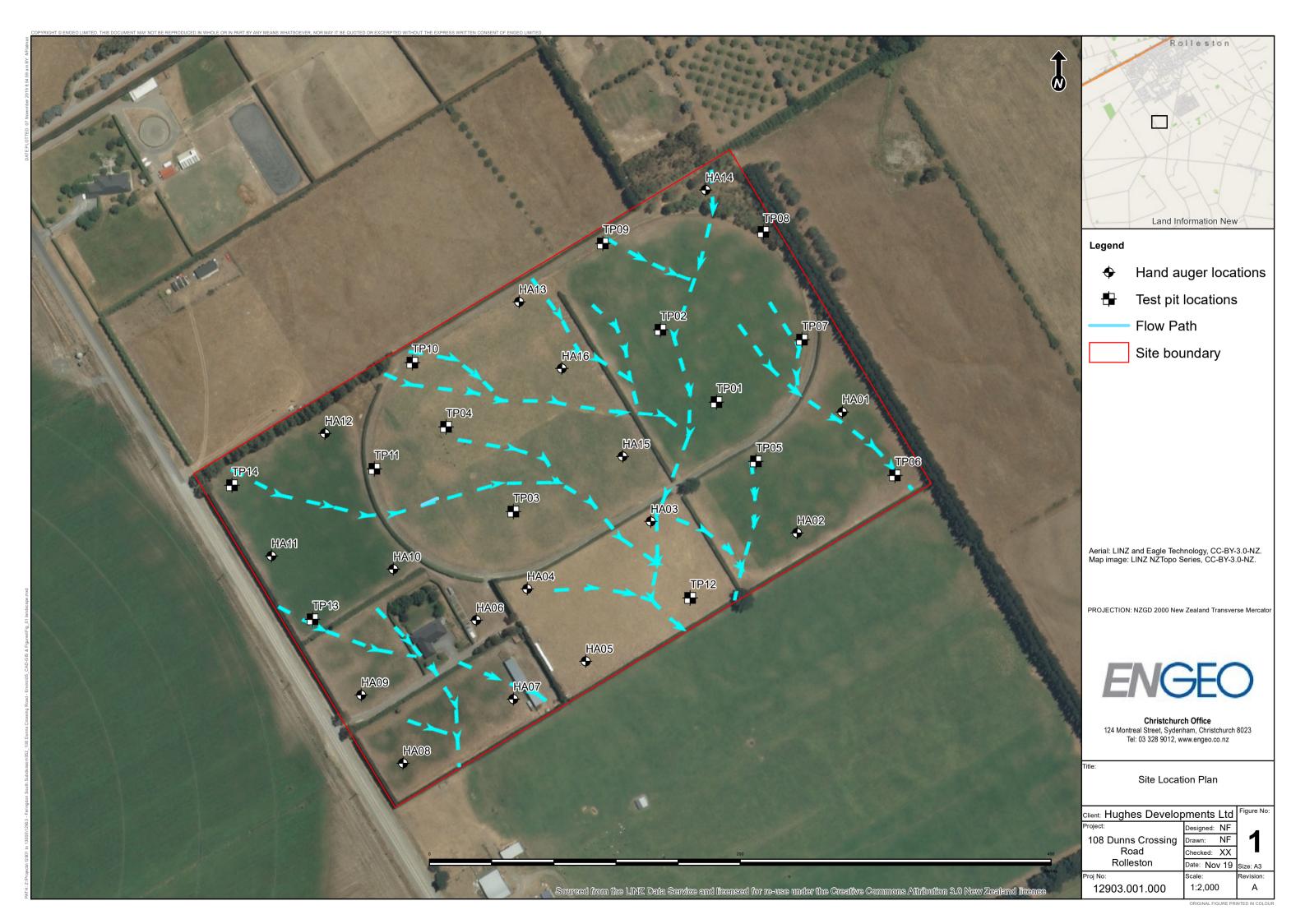




APPENDIX 1:

Site Plan and Inferred Paleo Channels







APPENDIX 2:

ENGEO Hand Auger and Test Pit Logs





Logged By: KF

Geotechnical Investigation 108 Dunns Crossing Road Rolleston

Client : Hughes Developments Ltd Shear Vane No: 1379 Client Ref. : N/A Date : 6.11.2019 Reviewed By : JRW Hole Depth: 0.2 m

Latitude: -43.624284

			12903	Hole De Hole Diame						Lor		le : -43 le : 17			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Blows	s per	tromete	n
-	TOPSOIL	ML	SILT with some sand, trace gravel brown. Low plasticity. Sand, fine [FOPSOIL].		Ш	>	D	F-St	<u> </u>	2	4	6	8 10	12
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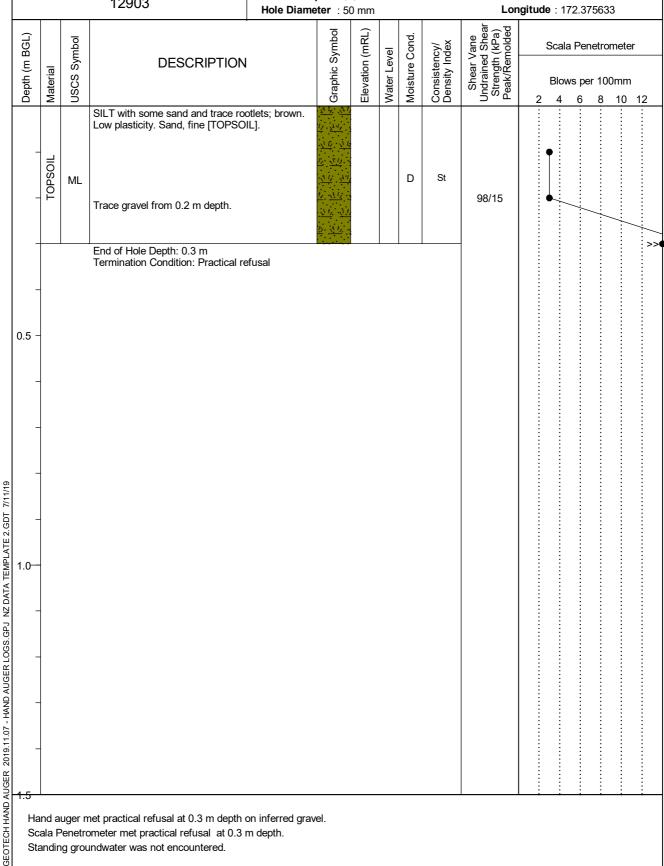
Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client : Hughes Developments Ltd Client Ref. : N/A Date : 6.11.2019 Hole Depth: 0.3 m

Reviewed By : JRW Latitude : -43.623539

Shear Vane No: 1379

Logged By: KF



Hand auger met practical refusal at 0.3 m depth on inferred gravel.

Scala Penetrometer met practical refusal at 0.3 m depth.



Geotechnical Investigation 108 Dunns Crossing Road Rolleston

Client : Hughes Developments Ltd Shear Vane No: 1379 Client Ref. : N/A Date : 6.11.2019 Hole Depth: 0.3 m

Reviewed By : JRW **Latitude**: -43.624218

Logged By: KF

			12903	Hole De Hole Diame	pth : 0. eter : 50	.3 m 0 mm					atitude : · ngitude : ·			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		ws per	etrometon 100mn 8 10	n
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-	TOPSOIL	ML	Gravel becomes minor from 0.2 m Gravel, fine, subangular to subrou	nded.				D	F-St					
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Geotechnical Investigation 108 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 6.11.2019 **Hole Depth**: 0.2 m

Shear Vane No: 1379 Logged By: KF Reviewed By : JRW Latitude : -43 624599

			12903	Hole Dep Hole Diame						Lor		le : -43 le : 17			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	l	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2			etrome 100m 8 1	
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Geotechnical Investigation 108 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A Date : 6.11.2019 Hole Depth : 0.2 m

Shear Vane No: 1379 Logged By: KF Reviewed By : JRW

Latitude: -43.625011

			12903	Hole Diame						Lor	atitude : - ngitude : 1		
Depth (m BGL)	ial	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		etromet	
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Geotechnical Investigation 108 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 6.11.2019 Hole Depth : 0.4 m

Shear Vane No: 1379 Logged By: KF $\textbf{Reviewed By}: \mathsf{JRW}$ Latitude : -43.62482

			12903	Hole Diame					T	Lor		de : -43 de : 172			
Depth (m BGL)	<u></u>	USCS Symbol	DESCRIPTION	I	Graphic Symbol	Elevation (mRL)	Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala	Pene	etrome	eter
Depth	Material	nscs			Graphi	Elevati	Water Level	Moistu	Consis	She Undrai Stren Peak/	2	Blows 4			ım 0 12
_	TOPSOIL	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSO	ILJ.				D	F-St				<u></u>		
	A	ML	Sandy SILT with trace gravel; grey Poorly graded. Sand, fine.	ish brown.				М	St-VSt			/	/		
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Geotechnical Investigation 108 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 6.11.2019 Hole Depth : 0.3 m

Logged By: KF Reviewed By : JRW Latitude : -43.625244

Shear Vane No: 1379

			12903	Hole Diame	eter : 50	0 mm				Lor		de : 172		2951	
n BGL)		ymbol	DESCRIPTIO	N	Graphic Symbol	Elevation (mRL)	evel	Cond.	ency/ Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala	Pene	etrome	eter
Depth (m BGL)	Material	USCS Symbol	BEOOK!! HO!		Graphic	Elevation	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Undrain Strengt Peak/R	2			100m 8 1	nm 0 12
			SILT with minor sand and trace r Low plasticity. Sand, fine [TOPS	ootlets; brown. OIL].	1/2 · 2/4 · 1/2 ·							_			
-	TOPSOIL	ML						D	F-St						
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Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client : Hughes Developments Ltd Client Ref. : N/A Date : 6.11.2019 Hole Depth: 0.4 m

Shear Vane No: 1379 Logged By: KF Reviewed By: JRW Latitude: -43.625581

Longitude: 172.37221 Hole Diameter: 50 mm Shear Vane Undrained Shear Strength (kPa) Peak/Remolded Graphic Symbol Elevation (mRL) Depth (m BGL) **JSCS Symbol** Moisture Cond. Consistency/ Density Index Scala Penetrometer Water Level **DESCRIPTION** Material Blows per 100mm 6 8 10 12 SILT with minor sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. TOPSOIL F-St ML D Trace gravel encountered from 0.2 m depth. Sandy SILT with trace gravel; greyish brown. Poorly graded. Sand, fine to medium. St-VSt ⋖ ML End of Hole Depth: 0.4 m Termination Condition: Practical refusal 0.5 GEOTECH HAND AUGER 2019:11.07 - HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 7/11/19 1.0-

Hand auger met practical refusal at 0.4 m depth on inferred gravel. Scala Penetrometer met practical refusal at 0.5 m depth.

Standing groundwater was not encountered.

A = ALLUVIUM



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903 Client : Hughes Developments Ltd
Client Ref. : N/A
Date : 6.11.2019
Hole Depth : 0.2 m

Shear Vane No : 1379 Logged By : KF Reviewed By : JRW Latitude : -43.625131

Longitude: 172.371905 Hole Diameter: 50 mm Shear Vane Undrained Shear Strength (kPa) Peak/Remolded Graphic Symbol Elevation (mRL) Depth (m BGL) **JSCS Symbol** Moisture Cond. Consistency/ Density Index Scala Penetrometer Water Level **DESCRIPTION** Material Blows per 100mm 6 8 10 12 SILT with minor sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. TOPSOIL D F-St ML End of Hole Depth: 0.2 m Termination Condition: Practical refusal 0.5 1.0-

Hand auger met practical refusal at 0.2 m depth on inferred gravel.

Scala Penetrometer met practical refusal at 0.3 m depth.

Standing groundwater was not encountered.

GEOTECH HAND AUGER 2019.11.07 - HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 7/11/19



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Shear Vane No: 1379 Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 6.11.2019 Hole Depth : 0.3 m

Latitude : -43.624514

Logged By: KF

Reviewed By : JRW

		12903	Hole Diame						Lor	gitud	e : 172			
BGL)	ymbol	DESCRIPTION		Symbol	(mRL)	svel	Cond.	ncy/ ndex	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala	Penet	tromete	er
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Standi A = AL		undwater was not encountered. JM												



Geotechnical Investigation 108 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A Date : 6.11.2019 Hole Depth: 0.2 m

Logged By: KF Reviewed By : JRW Latitude : -43.62435

Shear Vane No: 1379

			12903	Hole De Hole Diame							atitude ngitude			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Blows	romete 00mm 3 10	
	TOPSOIL	ML	SILT with minor sand, trace gravel brown. Low plasticity. Sand, fine				7	D	F-St			•		12
0.5 -			End of Hole Depth: 0.2 m Termination Condition: Practical re	efusal										
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Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 6.11.2019 Hole Depth : 0.5 m

Shear Vane No: 1379 Logged By: KF Reviewed By : JRW Latitude: -43.623729

			12903	Hole Diame	eter : 5					Lor		le : 172			
BGL		mbol	5500000000		symbol	(mRL)	vel	Cond.	ncy/ ndex	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala	Pene	trome	ter
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	l	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear ndraine Strengtheak/Re				100m	
	TOPSOIL	D ML	SILT with minor sand, trace grave brown. Low plasticity. Sand, fine [l and rootlets; TOPSOIL].	6. 40 7. 47 7. 47 7. 47 7. 47 7. 47 7. 47 9. 20	ш_	W	D	F-St	2	2	4	6	8 10	0 12
	ALLUVIUM	ML	Sandy SILT with trace gravel; green Poorly graded. Sand, fine to media	yish brown. um.					St-VSt						
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Geotechnical Investigation 108 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 6.11.2019 **Hole Depth**: 0.2 m

Logged By: KF Reviewed By : JRW Latitude -43 622894

Shear Vane No: 1379

Depth (m BGL)		loqu			1 20					. n m w	ı			
ΛI	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2		100m	
	TOPSOIL	ML	SILT with some sand, minor grave rootlets; brown. Low plasticity. Sar Gravel, fine, subangular to subrou [TOPSOIL].	l and trace nd, fine. nded		Ш	>	D	F-St		2	4	•	
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Logged By: KF

Geotechnical Investigation 108 Dunns Crossing Road Rolleston

Shear Vane No: 1379 Client: Hughes Developments Ltd Client Ref. : N/A Date : 6.11.2019 Reviewed By : JRW Hole Depth : 0.2 m

Latitude: -43.622343

12903			Hole Diameter : 50 mm						Latitude : -43.622343 Longitude : 172.374581						
Depth (m BGL)	ırial	USCS Symbol	DESCRIPTION	1	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm				
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Geotechnical Investigation 108 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A Date : 6.11.2019 Hole Depth : 0.3 m

Shear Vane No: 1379 Logged By: KF Reviewed By : JRW

Latitude: -43.623853

12903			12903	Hole Diameter : 50 mm						Lor	Latitude : -43.623853 Longitude : 172.373841				
Depth (m BGL)	ərial	USCS Symbol	DESCRIPTION	I	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm				
Dept	Material	OSO			Grap	Elev	Wate	Mois	Cons	Str. Str. Pea	2		6 8		12
-	TOPSOIL	ML	SILT with minor sand and trace ro Low plasticity. Sand, fine [TOPSO	otlets; brown. IL].	1. 34. 3 1. 34. 3 1. 34. 3 1. 34. 3 1. 34. 3 1. 34. 3 1. 34. 3			M	F-St						
_			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal	<u> </u>										
_														Þ	
															\
0.5 -															•
_															
-															
_															:
_	-														
1.0															
_															:
_															
_															
															:
										1	1 :	:			i



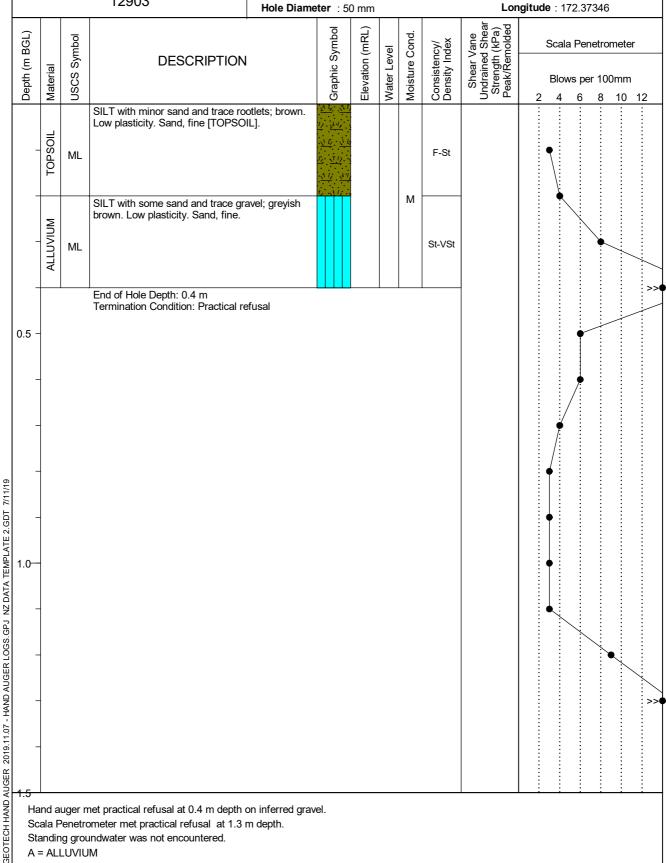
Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Standing groundwater was not encountered.

A = ALLUVIUM

Client: Hughes Developments Ltd Client Ref. : N/A Date: 6.11.2019 Hole Depth: 0.4 m

Shear Vane No: 1379 Logged By: KF Reviewed By: JRW Latitude : -43.623384





Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd Shear Vane No: N/A

Date: 4.11.2019 Logged By: KF

Max Test Pit Depth: 2 mReviewed By : JRWDigger Type/Size: Bucket ExcavatorLatitude : -43.623566Bucket Type/Size: 24 TonneLongitude : 172.374608

Depth (m BGL)	Material	(Rel	cavatabi ative Sc	ळ kijii Harder (a Ki	USCS Symbol	DESC	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)			netrom er 100r	
Det	ă Ž	Ëä		Hai	S			8	<u>e</u>	Na	₹	G G	Pe	2	4 6	8 10	12
0.5	ST		***		ML GW	rootlets; brown. Lo [TOPSOIL]. Sandy fine to coar silt and trace rootl graded, subangula fine to medium. Sandy fine to coar	and, travel gravel and ow plasticity. Sand, fine rse GRAVEL with some ets; greyish brown. Well ar to subrounded. Sand, rse GRAVEL; grey. Well ar to subrounded. Sand,		ш_		D	S-F		2	•		>>1
1.0-	ALLUVIUM				GW	Becomes moist from	·					MD-D					
1.5						Cobble becomes r	minor from 1.7 m depth.				M						
2	1							召									
2.0-						Depth of Excavation Termination Cond	on: 2 m ition: Target depth										
2.5	-												I	<u> </u>			<u> </u>

Test pit met target depth. Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019.11.05 - TEST PIT LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 8/11/19



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A

Date: 4.11.2019

Logged By: KF

Max Test Pit Depth: 2 mReviewed By : JRWDigger Type/Size: Bucket ExcavatorLatitude : -43.623119Bucket Type/Size: 24 TonneLongitude : 172.374217

			129	903		Bucket Type/Size : 24			.OI			Longitude	172.37		
Depth (m BGL)	Material		cavatability ative Scale	Sym	DESC	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blows	Penetrom per 100	
_	TS			ML	rootlets; brown. Lo	and, travel gravel and ow plasticity. Sand, fine	17 · ½·17 · ½·17 ·			D	S-F		2		
0.5 -				GW	silt and rootlets; g	lium GRAVEL with trace reyish brown. Well ar to subrounded. Sand,					MD-D				
1.0-	ALLUVIUM			sw	Gravelly fine to co grey. Well graded subangular to sub	arse SAND; brownish . Gravel, fine to coarse, rounded.				М	MD-D				>>
1.5 -	TA AL			GW	cobble; grey. Well subrounded. Sand	rse GRAVEL with trace graded, subangular to d, fine to coarse. countered from 1.5 m					MD-D				
2.0	-	L		ļ	Depth of Excavation Termination Cond	on: 2 m lition: Target depth									
2.5															•

Test pit met target depth. Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019.11.05 - TEST PIT LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 8/11/19



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A **Date**: 4.11.2019 Logged By: KF

Reviewed By : JRW Max Test Pit Depth : 2 m Digger Type/Size : Bucket Excavator Latitude: -43.624211 **Longitude**: 172.372983 Bucket Type/Size : 24 Tonne

<u> </u>							Bucket Type/Size	24 Ionne)				Longitude	9:1/	2.37	2983	
Depth (m BGL)	Material	Easier (Relat	ivatal ive S	tility Scale) Harder	USCS Symbol	DESC	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)		ows	per 1	romete
0.5 -	ST				ML	rootlets; brown. Lo [TOPSOIL]. Sandy fine to coar silt and rootlets; gr	and, travel gravel and ow plasticity. Sand, fine rse GRAVEL with trace reyish brown. Well ar to subrounded. Sand				D	S-F			•	•	
1.0	ALLUVIUM				GW	from 1.0 m depth. Becomes moist ar depth.	cobbles encountered and grey from 1.2 m ome from 1.4 to 1.6 m				М	MD-D					
2.0						Depth of Excavation Termination Cond	on: 2 m lition: Target depth										
2.5																	
Scal	la Pe	met ta enetro	mete	er met	pract	ical refusal. t encountered.	Т	S = TOPS	SOIL								



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 4.11.2019 Logged By: KF

Max Test Pit Depth : 2 m Reviewed By : JRW Digger Type/Size : Bucket Excavator Latitude: -43.623729 **Longitude**: 172.372618 Bucket Type/Size : 24 Tonne

						Bucket Type/Size . 2		,				Longitude	. 17	2.51	201	0	
Depth (m BGL)	Material	Easier (Easier (Easier	avata ative S	y tilid Harder Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)			per	100	meter Omm
-	TS				ML	SILT with some sand, travel gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].	7. 17. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7. 7				S-F			•			
0.5 -						Sandy fine to coarse GRAVEL with some silt and trace rootlets; greyish brown. Well graded, subangular to subrounded. Sand, fine to coarse.				D							Á
1.0-	ALLUVIUM				GW	Trace silt and trace cobbles encountered from 1.0 m depth. Becomes moist from 1.2 m depth.					MD-D						
1.5 -	AL					Sand becomes some from 1.7 m depth.				M							
2.0						Depth of Excavation: 2 m											
2.0						Termination Condition: Target depth											
2.5																	
; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;																	
Test Scal Star																	
Test Sca Star	la Pe	enetro	omete	depth er met ater w	pract	ical refusal. TS t encountered.	s = TOPS	SOIL									



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 4.11.2019 Logged By: KF

Max Test Pit Depth : 1.9 m Reviewed By: JRW Digger Type/Size : Bucket Excavator Latitude : -43.6239 Longitude: 172.374871 Bucket Type/Size : 24 Tonne

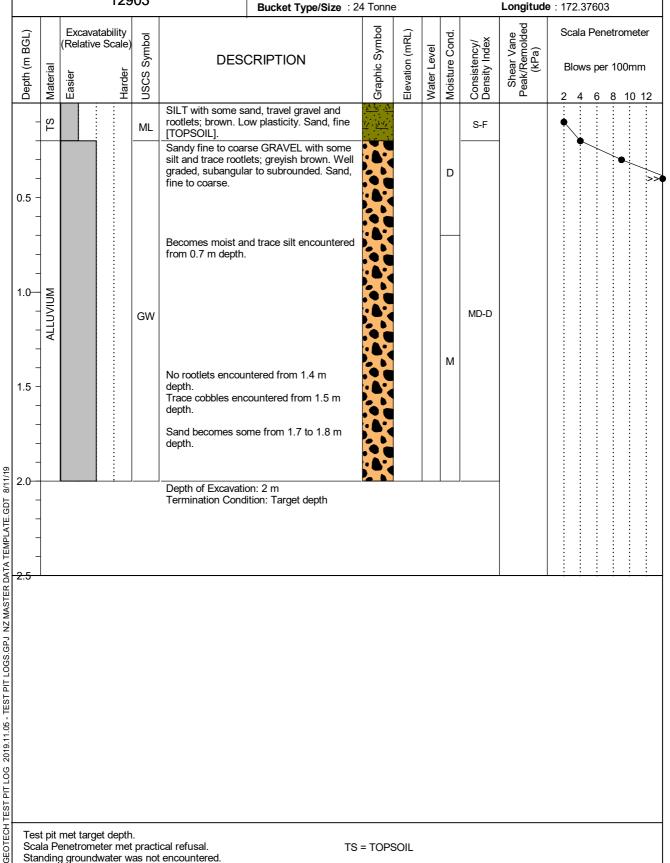
							Bucket Type/Size	24 Tonne	;				Longitude	e:1/2	2.374	8/1	
Depth (m BGL)	Material	Exca (Relat (Resiet	vatal ive S	y (elaci	USCS Symbol	DESCF	RIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo		er 10	omete 00mm 10 1
-	TS				ML	SILT with some sand rootlets; brown. Low [TOPSOIL].	d, travel gravel and plasticity. Sand, fine	1/ · 2/1/			D	S-F		•	\ <u>`</u>		
0.5 -						Sandy fine to coarse rootlets; greyish brov subangular to subrou coarse.	GRAVEL with trace vn. Well graded, unded. Sand, fine to									f	•
1.0-	ALLUVIUM				GW	Sand becomes trace depth.					М	MD-D					
- 1.5 - - -						Trace cobbles encou depth.	intered from 1.2 m										
2.0 - -						Depth of Excavation: Termination Condition	: 1.9 m on: Practical refusal										
2.5																	
Sca	la P	met pr	mete	r met	pract	ical refusal. t encountered.	Lc TS	posely pao S = TOPS	cked g	grave	el and	d pit colla	pse from 0).5 to 1	.9 m	dept	h.



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Logged By: KF Date: 4.11.2019

Max Test Pit Depth : 2 m Reviewed By: JRW Digger Type/Size : Bucket Excavator Latitude: -43.623947



Test pit met target depth. Scala Penetrometer met practical refusal. Standing groundwater was not encountered



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A **Date**: 4.11.2019 Logged By: KF

Max Test Pit Depth : 2 m Reviewed By : JRW Digger Type/Size : Bucket Excavator Latitude : -43.623251 **Longitude**: 172.375413 Bucket Type/Size : 24 Tonne

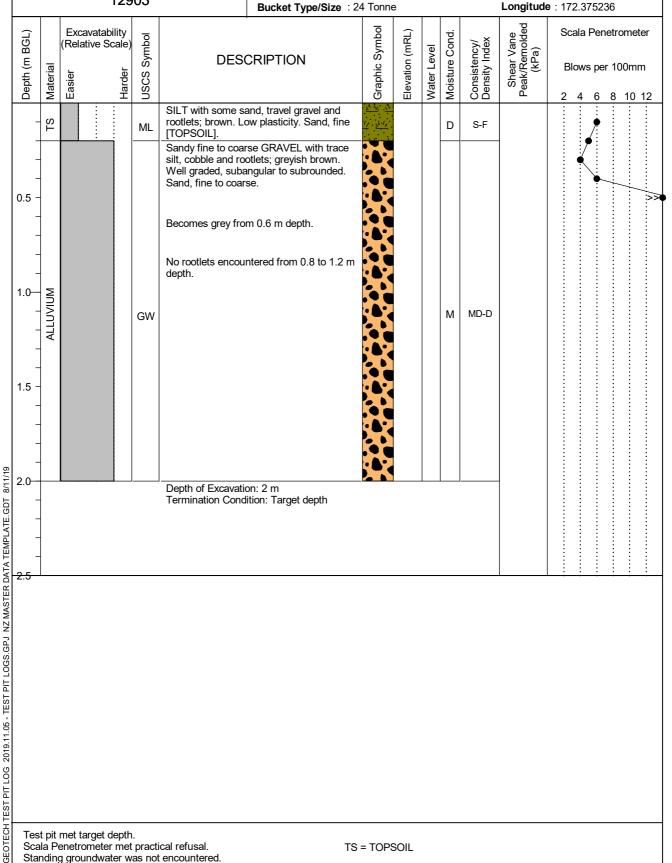
							Bucket Type/Size	. 24 101111	-				Longitude	3.172	375	+13	
Depth (m BGL)	Material	Easier (Rela)	avatab tive S	Harder (elbo	USCS Symbol	DESC	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo		er 100	meter Omm
-	TS				ML	SILT with some sa rootlets; brown. Lo [TOPSOIL].	and, travel gravel and ow plasticity. Sand, fine	\(\frac{1}{74} \cdot \frac{7}{74} \cdot \frac{7}{74			D	S-F		•			
0.5 -						silt, cobble and ro	rse GRAVEL with trace otlets; greyish brown. angular to subrounded. ise.										\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
1.0-	ALLUVIUM				GW	Becomes grey from	m 0.8 m depth.				М	MD-D					
1.5 -	ALLI					Cobbles becomes depth.	minor from 1.2 m										
2.0						depth.	ome from 1.8 to 1.9 m										
GEOTIECH IEST PILLOG 2019:11:05 - IEST PILLOGS:GPU NZ MASTER DATA TEMPLATE.GDU 8/11/19 2 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7 -						Depth of Excavation Termination Cond	on: 2 m lition: Target depth										
2.5 2.5																	
PII LOGS.GP3 P																	
2019.11.05 - 1E51																	
IEST PII LOG Z																	
Test Scal	la Pe	met ta enetro g grou	meter	r met	pract	ical refusal. t encountered.	T	rs = tops	SOIL								



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Logged By: KF Date: 4.11.2019

Max Test Pit Depth : 2 m Reviewed By: JRW Digger Type/Size : Bucket Excavator Latitude: -43.622696



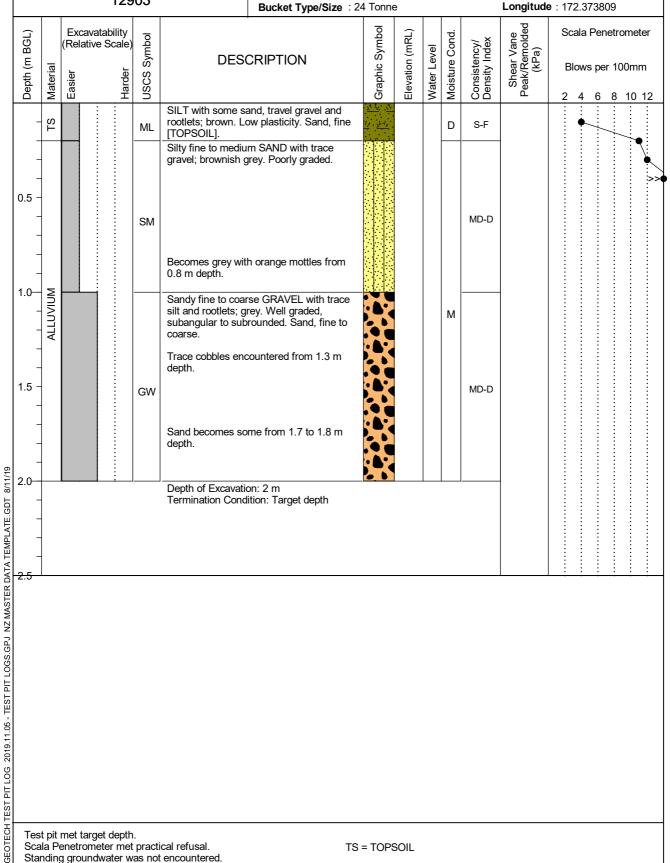
Test pit met target depth. Scala Penetrometer met practical refusal. Standing groundwater was not encountered



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Logged By: KF Date: 4.11.2019

Max Test Pit Depth : 2 m Reviewed By: JRW Digger Type/Size : Bucket Excavator Latitude: -43.622572 Bucket Type/Size : 24 Tonne



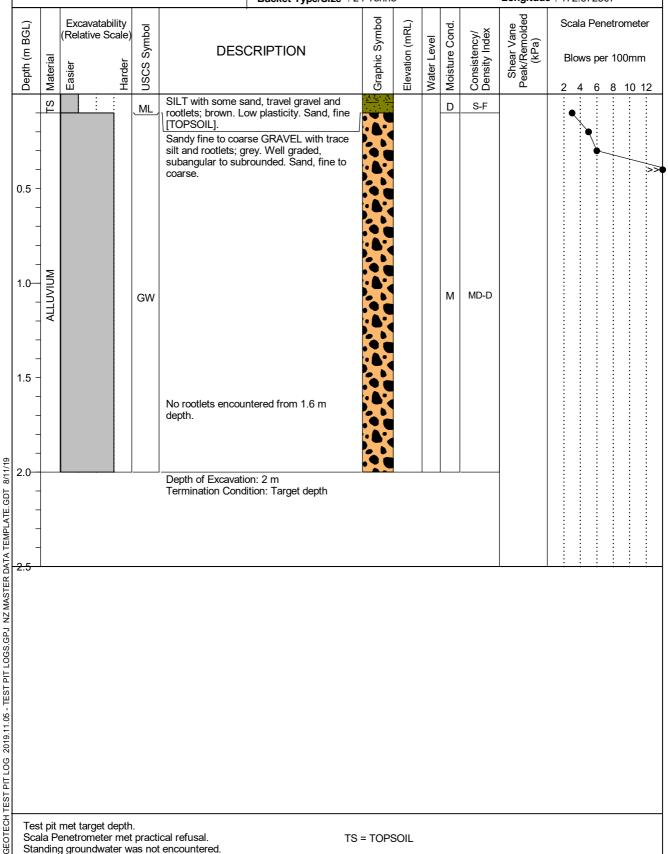
Test pit met target depth. Scala Penetrometer met practical refusal. Standing groundwater was not encountered



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Logged By: KF Date: 4.11.2019 Reviewed By: JRW

Max Test Pit Depth : 2 m Digger Type/Size : Bucket Excavator Latitude : -43.623232 Bucket Type/Size : 24 Tonne Longitude: 172.372307



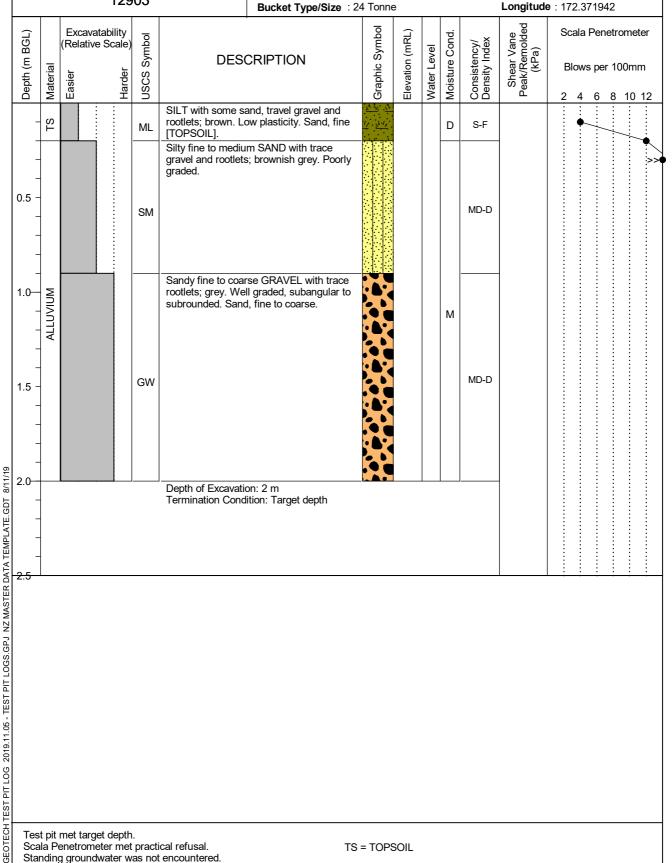
Test pit met target depth. Scala Penetrometer met practical refusal. Standing groundwater was not encountered



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Logged By: KF Date: 4.11.2019

Max Test Pit Depth : 2 m Reviewed By: JRW Digger Type/Size : Bucket Excavator Latitude: -43.623923



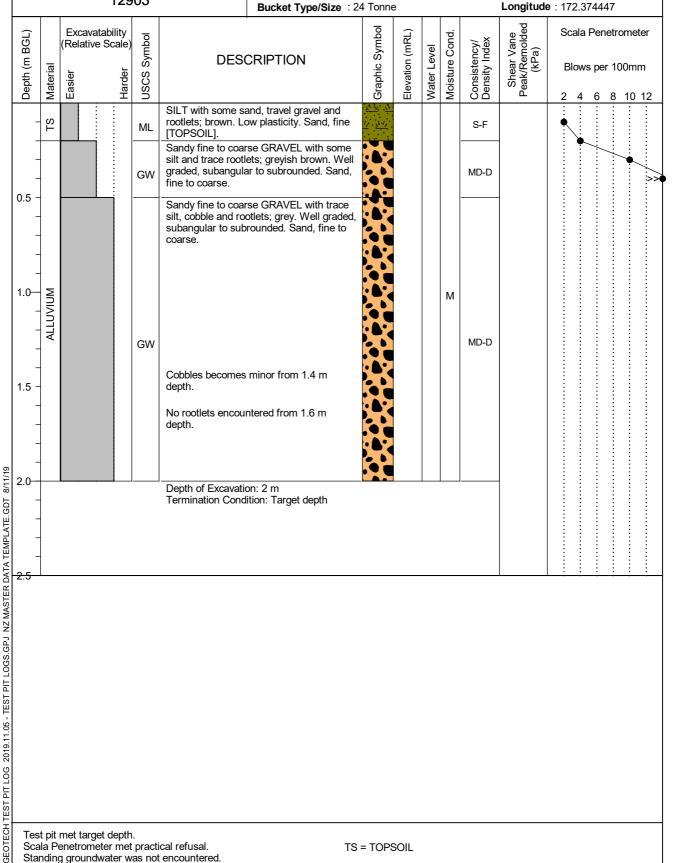
Test pit met target depth. Scala Penetrometer met practical refusal. Standing groundwater was not encountered



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Logged By: KF Date: 4.11.2019

Max Test Pit Depth : 2 m Reviewed By: JRW Digger Type/Size : Bucket Excavator Latitude: -43.624622



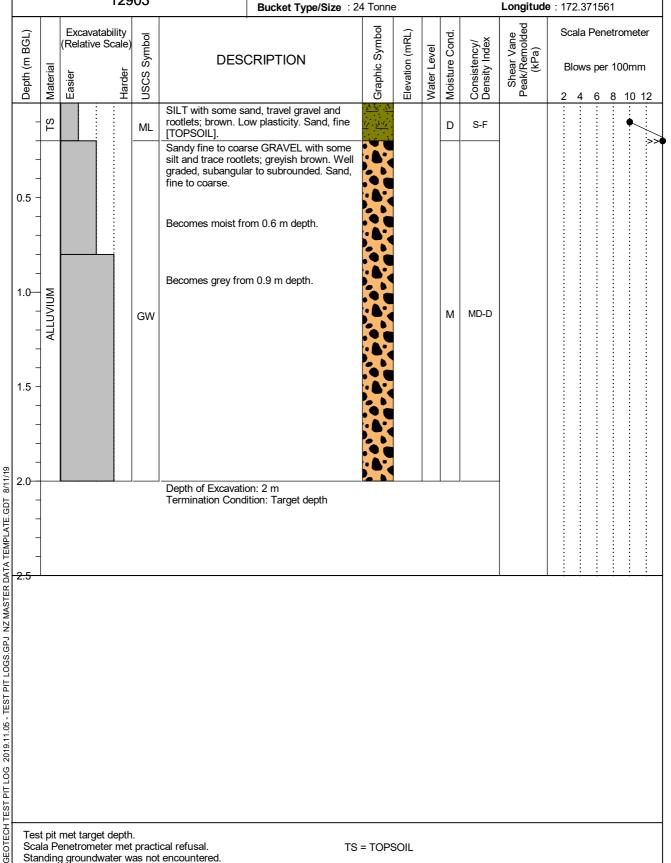
Test pit met target depth. Scala Penetrometer met practical refusal. Standing groundwater was not encountered



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Logged By: KF Date: 4.11.2019

Max Test Pit Depth : 2 m Reviewed By: JRW Digger Type/Size : Bucket Excavator Latitude : -43.62475 Bucket Type/Size : 24 Tonne



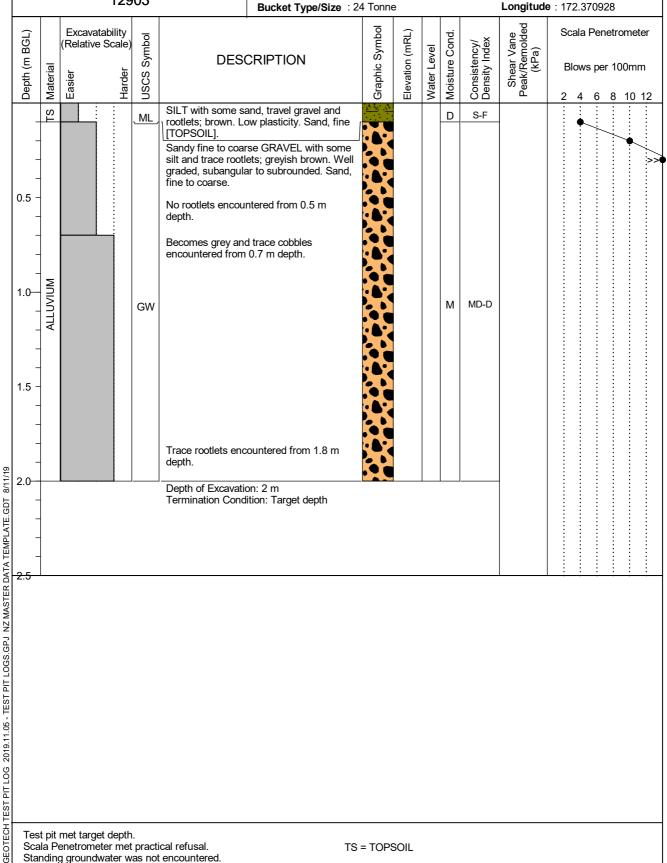
Test pit met target depth. Scala Penetrometer met practical refusal. Standing groundwater was not encountered



Geotechnical Investigation 108 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Logged By: KF Date: 4.11.2019 Reviewed By: JRW

Max Test Pit Depth : 2 m Digger Type/Size : Bucket Excavator Latitude: -43.623982



Test pit met target depth. Scala Penetrometer met practical refusal. Standing groundwater was not encountered



APPENDIX 3:

ECan Boreholes



Bore or Well No	M36/4449
Well Name	DUNNS CROSSING RD
Owner	TYACK GJ & FR



Well Number	M36/4449	File Number	CO6C/02046
Owner	TYACK GJ & FR	Well Status	Not Used
Street/Road	DUNNS CROSSING RD	NZTM Grid Reference	BX23:49508-69470
Locality	ROLLESTON	NZTM X and Y	1549508 - 5169470
Location Description	LOT 1	Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Irrigation,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	24.20m	Water Level Count	0
Diameter	150mm	Initial Water Level	
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	38.81m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	9	Calc Min 95%	7.70m below MP
Aquifer Name	Riccarton Gravel	Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	09 Jun 1992	Max Tested Yield	6 l/s
Driller	Dynes Road Drilling	Drawdown at Max Tested Yield	5 m
Drilling Method	Cable Tool	Specific Capacity	1.36 l/s/m
Casing Material		Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Borelog for well M36/4449

Grid Reference (NZTM): 1549508 mE, 5169471 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 38.8 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 24.2 m Drill Date: 09-Jun-1992



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
5		8.00m	00000000 00000000 00000000 00000000 0000	Medium-small gravel	
10		10.00m	00000000 00000000 00000000 00000000 0000	Medium-small gravel, very open	
		12.00m	000000000 00000000 00000000 000000000 0000	Medium-small gravel	
		14.00m _	000000 000000	Claybound small-medium gravel	
15				Small to large sandy gravel	
20		18.00m _	00000000 00000000 00000000 00000000 0000	Medium gravel, Water-bearing	
		22.00m	00000000 00000000 00000000 00000000 0000	Small-medium gravel,clean,open	
		24.00m	000000000 000000000 000000000 00000000	Small to medium gravel,stained	

Bore or Well No	M36/4450
Well Name	DUNNS CROSSING RD
Owner	Mr & Mrs L K & J C Blackmore



Well Number	M36/4450	File Number	CO6C/02046
Owner	Mr & Mrs L K & J C Blackmore	Well Status	Active (exist, present)
Street/Road	DUNNS CROSSING RD	NZTM Grid Reference	BX23:49388-69660
Locality	ROLLESTON	NZTM X and Y	1549388 - 5169660
Location Description	DP61278 LOT 2	Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Irrigation,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	25.20m	Water Level Count	0
Diameter	150mm	Initial Water Level	
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	39.62m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	8	Calc Min 95%	8.10m below MP
Aquifer Name	Riccarton Gravel	Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	09 Apr 1992	Max Tested Yield	6 l/s
Driller	Dynes Road Drilling	Drawdown at Max Tested Yield	6 m
Drilling Method	Cable Tool	Specific Capacity	1.00 l/s/m
Casing Material		Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	23.2	25.2				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
09 Apr 1992	1	6.1	80.50892	6.1	0

No comments for this well

Borelog for well M36/4450

Grid Reference (NZTM): 1549388 mE, 5169661 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 39.6 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 26.5 m Drill Date: 09-Apr-1992



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
5			00000000 00000000 00000000 00000000 0000	Medium to small gravel	
		8.00m _	0000000	Small to medium gravel, clay	
10		12.00m	000000 000000 000000		
15		12.00111	000000 000000 000000 000000	Clay, small to medium gravel	
20		18.00m _		Pea gravel and sand	
20		22.00m _	0.0.0.0.0 0.0.0.0 0.0.0.0 0.0.0.0	Pea gravel, sand, water	
25		24.00m	000000000	Tight clay and sand Medium to small gravel, open water	
\parallel		26.00m _ 26.50m	000000000	Tight clay and sand	

Bore or Well No	M36/5038
Well Name	DUNNS CROSSING ROAD
Owner	KAJENS TRADING DEVELOPMENT LTD



Well Number	M36/5038	File Number	CO6C/10010
Owner	KAJENS TRADING DEVELOPMENT LTD	Well Status	Active (exist, present)
Street/Road	DUNNS CROSSING ROAD	NZTM Grid Reference	BX23:49278-69840
Locality	ROLLESTON	NZTM X and Y	1549278 - 5169840
Location Description		Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Domestic Supply,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	32.10m	Water Level Count	0
Diameter	150mm	Initial Water Level	6.30m below MP
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	40.38m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	7	Calc Min 95%	8.50m below MP
Aquifer Name		Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	01 Nov 1996	Max Tested Yield	24 l/s
Driller	Dynes Road Drilling	Drawdown at Max Tested Yield	9 m
Drilling Method	Cable Tool	Specific Capacity	2.84 l/s/m
Casing Material	STEEL	Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	30.1	32.1				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
01 Nov 1996	1	24.1	318.076233	8.5	2

No comments for this well

Borelog for well M36/5038

Grid Reference (NZTM): 1549278 mE, 5169841 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 40.4 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 32.0 m Drill Date: 01-Nov-1996



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
			0==0==0==	Small gravel silt bound	
Н			==0==0		
Ш			0==0==0==		
			==0==0		
Н			0==0==0==		
Ц		4.00m _	000		
_			0.0.0.0.0	small medium gravel sandy	
5			0.0.0.0.0		
- 4			0.0.0.0.0		
			.0.0.0.0.		
			• • • • • • • • • •		
H		8.39m	0.0.0.0		
			000000000	Small medium gravel with wet yellow	
			000000000	silt, small amount of water	
10			000000000		
			000000000		
		12.00	000000000		
Н		12.00m _	56666666	Small medium gravel siltboundvery	
Ц			00000000	tight	
			00000000		
Н		14.40m _	898989898	Carallana di una annual annual annual	
15)*. 0 **0**0*1	Small medium gravel, sandyenough water to keep hand pump going.	
			0.0.0.0.0		
П			0.0.0.0.0		
Н			.0.0.0.0.		
			0.0.0.0.0		
			0.0.0.0.0		
- 1			0.0.0.0.0		
20			 000.		
			0.0.0.0.0		
Н			0.0.0.0.0		
Н		22.00m _	0.0000000	Corollars diversional anady	
			1.0.0.0.0.	Small medium gravel sandy	
П			0.0.0.0.0		
Н		24.20m _	0.0.0.0.0		
25			000000000	Small medium gravel brown stain clean	
			000000000		
- 1			000000000		
			0000000000		
			000000000		
- 1			000000000		
- 4			000000000		
30			ÖÖÖÖÖÖÖÖÖ		
- T		Ш	000000000		
Н			000000000		
		32.00m	0000000000		

Bore or Well No	M36/5041
Well Name	DUNNS CROSSING ROAD
Owner	KAJENS TRADING DEVELOPMENT LTD



Well Number	M36/5041	File Number	CO6C/10302
Owner	KAJENS TRADING DEVELOPMENT LTD	Well Status	Active (exist, present)
Street/Road	DUNNS CROSSING ROAD	NZTM Grid Reference	BX23:49507-69990
Locality	ROLLESTON	NZTM X and Y	1549507 - 5169990
Location Description		Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Domestic Supply,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	32.00m	Water Level Count	0
Diameter	150mm	Initial Water Level	6.80m below MP
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	40.47m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	10	Calc Min 95%	8.60m below MP
Aquifer Name		Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	01 Feb 1997	Max Tested Yield	5 l/s
Driller	Dynes Road Drilling	Drawdown at Max Tested Yield	13 m
Drilling Method	Cable Tool	Specific Capacity	0.40 l/s/m
Casing Material	STEEL	Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	30	32				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
01 Feb 1997	1	5.1	67.31074	12.8	2

No comments for this well

Borelog for well M36/5041

Grid Reference (NZTM): 1549508 mE, 5169991 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 40.5 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 34.0 m Drill Date: 01-Feb-1997



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
		2.00m	0.0.0.0.0.0	Small medium gravel very sandy	
		_	000000000 000000000 000000000	Small medium gravel siltbound	
5		5.40m _	000000000	Small medium gravel sand	
10		8.19m _	000000000 0000000000000000000000000000	Small medium gravel siltbound, tight	
		12.80m	000000000		
15		-	000000000 000000000 000000000	Small medium gravel silt wash gravel brown	
		16.79m _	000000000	Smalll medium gravel sand traces of yellow silt	
20		21.00m _	0.0.0.0.0	Small medium gravel sandy driving	
25			0.0.0.0.0 0.0.0.0.0 0.0.0.0.0 0.0.0.0.0		
		25.40m _	**************************************	Small medium gravel traces silt water	
30		30.00m	0.00.00.00	Small medium gravel gravel small almost sand	
\parallel		34.00m _	000000000	Small gravel siltboundwater dropping off	



Christchurch

Submitted to:

Hughes Developments Ltd Christchurch

ENGEO Limited

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Figure 2: Historical Aerial Photo – 1940 to 1944

Figure 3: Nearby ECan Borehole Locations

Appendices

Appendix 1: Site Plan and Inferred Paleo Channels

Appendix 2: ENGEO Hand Auger and Test Pit Logs

Appendix 3: ECan Borelogs

ENGEO Document Control:

Report Title	Revised Geotechnical Investigation - 92 Dunns Crossing Road, Rolleston			
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Client	Hughes Developments Ltd Client Contact Kelvin Back			ζ.
Distribution (PDF)	Kelvin Back			
Date	Revision Details/Status	WP	Author	Reviewer
2019/12/06	19/12/06 Issued to Client		KF	GM
2019/12/13 Issued to Client – revised		DF	KF	GM



1 Introduction

ENGEO Ltd was requested by Hughes Developments Ltd to undertake a geotechnical investigation of the property at 92 Dunns Crossing Road, Rolleston, Christchurch, and a neighbouring section off Goulds Road, as outlined in our variation proposal (ref: P2019.002.259_01).

The purpose of this assessment was to conceptualise a geological model of the site, assess the likely future land performance, comment on the suitability of the site for residential subdivision, address the requirements of Section 106 of the Resource Management Act (RMA) and provide recommendations for subdivision works and foundations for typical timber framed residential dwellings.

Our scope of works included the following:

- Complete a desktop study of relevant available geotechnical and geological publications, including the NZ Geotechnical and Environment Canterbury Databases;
- Undertake a geotechnical site walkover;
- Undertake forty hand auger boreholes with associated Scala penetrometer tests to assess the near surface material types and strength characteristics;
- Organise and technically supervise the excavation of forty-five test pits, including geotechnical logging of the exposed soils; and
- Preparation of this report outlining our findings on the ground conditions and the suitability of the site for residential subdivision, including geotechnical advice on the likely foundation Technical Category, conceptual foundation recommendations for typical timber framed residential dwellings, and address likely geohazards as required by Section 106 of the RMA.

ENGEO previously issued a Geotechnical Investigation report dated 6 December 2019 (ref: 12903.001.000_01), which included thirty-three hand augers and thirty-two test pit investigations. Our testing scope was reduced, due to three paddocks being unavailable for testing at that time. Subsurface testing has now been completed in the three remaining paddocks, finalising the testing for this site. This version of our report supersedes our original report for the site dated 6 December 2019.

2 Site Description

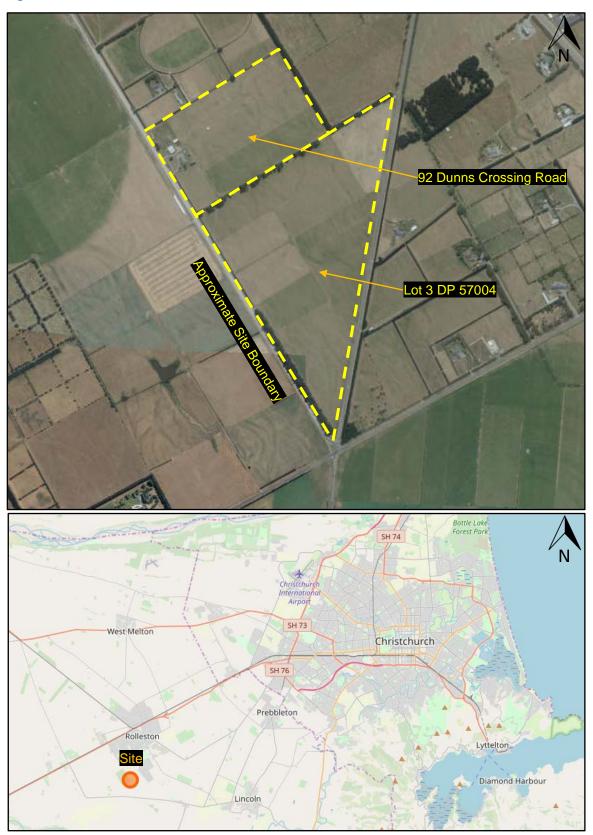
The site comprises of two properties with a total area of 30.8 ha and have the following legal descriptions (Canterbury Maps):

- 92 Dunns Crossing Road Lot 1 DP 61278 10.1 ha
- Lot 3 DP 57004 20.7 ha

They are located approximately 3 km southwest of Rolleston town centre. They are both bound to the southwest by Dunns Crossing Road. 92 Dunns Crossing Road is bound to all other sides by rural properties, whereas the neighbouring property is bound to the east by Goulds Road (Figure 1).



Figure 1: Site Location Plan



 ${\bf Images\ sourced\ from\ Canterbury\ Maps\ and\ ``©\ OpenStreetMap\ contributors".\ Not\ to\ scale.}$



3 Geological Model

3.1 Regional Geology

The site has been regionally mapped by GNS (Forsyth et al., 2008) as being underlain by brownish grey river alluvium (Q2a).

3.2 Geomorphology

The site comprises relatively flat ground, with gentle undulations and depressions in some areas. As evident on aerial imagery (Canterbury Maps, 2019) and observed during our site walkover conducted on 21 November 2019, undulating and depressed ground can be attributed to paleo-channels, which traverse the site in a general northwest to southeast direction (Figure 2). Based on observations, sandy silt deposits with variable thickness (up to 0.6 m) are expected to have in-filled the paleo-channels where they have not remained as channel features. Inferred paleo-channels have been mapped to give an indication of areas with potential channel in-fill (Appendix 1).

Part of the state of the state

Figure 2: Historical Aerial Photo – 1940 to 1944

Image sourced from Canterbury Maps. Not to scale.



3.3 Geohazards

3.3.1 Seismicity

There are no known or mapped faults in the immediate area of the site, however the site may be at risk of ground shaking induced by movement of proximal or distal faults.

The site is located between two recently discovered fault systems, the Greendale Fault and the Port Hills Fault, the ruptures of which initiated the ongoing Canterbury Earthquake Sequence (CES). The Greendale Fault has been mapped approximately 6 km north / northwest of the site and trends roughly east-west with a surface rupture length of approximately 28 km (GNS, 2015), while the Port Hills Fault remains unmapped as the fault did not rupture at the surface. Movement on the Port Hills Fault is believed to have extended to within 1 km to 2 km below ground surface.

Large regional areas of faulting (GNS, 2015) namely the Ashley Fault, Porters Pass - Amberley Fault Zone, and the Hope and Alpine Faults, are further afield but present a high seismic hazard to the Christchurch area due to the anticipated size of earthquakes generated. The largest of these faults is the Alpine Fault, which has a return period of 250 - 300 years and is expected to produce a M8 earthquake. The last rupture on the Alpine Fault is believed to have occurred in 1717 (Pettinga et al., 2001).

3.3.2 Liquefaction and Lateral Spreading

The site is located in an area mapped where "damaging liquefaction is unlikely" (NZGD Map CGD5140, 2012), and a "zone of very low liquefaction potential" (GNS, 2006).

3.4 Site Investigation

Site investigations to assess the shallow subsurface material types and strength characteristics were undertaken by ENGEO from 22 November to 6 December 2019. Forty-five test pits and forty-one hand auger investigations with associated Scala Penetrometer tests were completed to a maximum depth of 2.1 m below ground level. An extra hand auger investigation was required due to the shape of the site, and the grid pattern adopted to accurately plan the testing locations.

The investigations revealed subsurface conditions across the site are consistent with the published geological mapping, as summarised in Table 2. Hand auger and test pit logs are attached as Appendix 2 of this report.

Table 1: Summary of Hand Auger Investigations

Soil Type	Depth to Top of Layer (m)	General Layer Thickness (m)	Density / Consistency	Additional Comments
TOPSOIL	0.0	0.1 – 0.2	Firm to Stiff	
Sandy SILT	0.1 – 0.2	0.1 – 0.5	Firm to Very Stiff	Consistent across the site



Table 2: Summary of Test Pit Investigations

Soil Type	Depth to Top of Layer (m)	General Layer Thickness (m)	Density / Consistency	Additional Comments
TOPSOIL	0.0	0.1 – 0.3	Firm to Stiff	-
SILT	0.1 – 0.3	0.2 – 0.3	Stiff to Very Stiff	Present in TP11, 22, 24 and 40
Silty SAND / SAND	0.3 – 0.6	0.2 – 0.5	Medium Dense to Dense	Silty sand present in TP09, 11 and sand present in TP36
Sandy GRAVEL	0.1 – 1.0	Unknown	Medium Dense to Very Dense	Consistent across the site Noticeable sand increase in TP03, 04, and 09

3.5 ECan Boreholes

A review of six deep ECan borehole logs was conducted. The first (M36/4449 & M36/4387), are located on-site, and appear to be water wells providing the properties irrigation and domestic supply. The other boreholes are located to the north (M36/4450), east (M36/20535), south (BX23/0895) and west (M36/7416) of the site.

Well logs from the six holes of interest are attached to this report as Appendix 3 and summarised in Table 3.

Table 3: Generalised Summary of ECan Boreholes

ECan Borehole	Total Depth (m)	Water Level Below Ground Level (m)	Generalised Borelog as Logged by Driller
BX23/0895	53	5.35	Varying sandy and silty gravel layers to 53 m.
M36/20535	30	7.1	Topsoil to 0.3 m with gravel from 0.3 to 30 m.
M36/4387	35	6.5	Grey / sandy gravel to 35 m, with a layer of clay-bound gravel from 6.6 to 20.7 m.
M36/4449	24	7.7	Gravel to 24 m with a layer of clay from 12 to 14 m and sandy gravel from 14 to 18 m.



ECan Borehole	Total Depth (m)	Water Level Below Ground Level (m)	Generalised Borelog as Logged by Driller
M36/4450	26	8.1	Gravel to 26 m with a layer of clayey gravel from 12 to 18 m, clay and sand from 22 to 24 m and 26 to 26.5 m.
M36/7416	47	5.18	Sandy gravel to 16.8 with a layer of clay-bound sandy gravel from 5.6 to 14.7 m, and predominant gravel to 23 m. Logs not available from 23 to 47 m.

Figure 3: Nearby ECan Borehole Locations



Aerial photograph sourced from Canterbury Maps. Not to scale.

3.6 Groundwater

Groundwater is recorded in the surrounding boreholes between approximately 5.18 m and 8.1 m depth.



3.7 Site Seismic Class

In accordance with NZS 1170.5:2004, Class D applies to this particular site, defining it as a 'deep soft soil site'.

4 Liquefaction Analysis

Owing to the nature of the subsurface materials and depth to groundwater at the site, we consider the potential for liquefaction and lateral spreading on the site to be very low.

We therefore consider future land performance to be in line with Technical Category 1 (TC1), whereby future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances.

5 RMA Section 106 Requirements and Suitability to Subdivide

Section 106 of the Resource Management Act 1991 states a consent authority may refuse to grant a subdivision consent, or may grant a consent subject to specific consent conditions if it considers that:

- There is a significant risk from natural hazards; or
- Sufficient provision has not been made for legal or physical access to each allotment to be created by the subdivision.

An assessment of the risk from natural hazards as required by the RMA includes the following:

- The likelihood of natural hazards occurring (whether individually or in combination);
- The material damage to land in respect of which the consent is sought, other land, or structures that would result from natural hazards; and
- Any likely subsequent use of the land in respect of which the consent is sought that would accelerate, worsen, or result in material damage of the kind referred to in paragraph (b).

We have assessed the risk of natural hazards at the site in accordance with Section 106 of the Resource Management Act (RMA) and considered the risk to the site from rockfall, inundation (debris), slope stability, subsidence, flooding and tsunami. Based on our observations and the nature of the site, its performance during the CES, and the site's distance from the nearest significant watercourse, we consider it is unlikely for the site to be subject to natural hazards such as rockfall, inundation (debris), slope stability, subsidence, flooding and tsunami. As such, the site is considered suitable for subdivision from a geotechnical perspective.

6 Geotechnical Recommendations

6.1 Earthworks

Earthworks carried out for the subdivision shall be in accordance with NZS 4404:2010, Land Development and Subdivision Infrastructure and NZS 4431:1989, Code of Practice for Earth filling for Residential Development. In particular, any areas to receive fill should be stripped of all vegetation, topsoil, non-engineered fill, soft or organic soils prior to fill placement.



Fill may comprise clean natural sandy gravel or silty soils, or clean imported soils and / or granular fill, compacted to achieve no less than 95% of maximum dry density. Fill faces steeper than 2V:1H and higher than 600 mm should be retained and referred back to ENGEO. Although unlikely, where any springs or groundwater seeps are encountered, they should be intercepted with suitable drainage and discharged to a Council approved outlet.

All unretained batters of pond and stormwater drains constructed with the native sandy gravel material should be at an inclination no steeper than 1V:3H, with protection schemes in place to control erosion of the formed batters within the waterways.

A comprehensive earthworks specification should be provided to the earthworks contractor prior to starting excavations and an inspection / testing regime agreed, along with a robust erosion and sediment control plan.

6.2 Subdivision Roading

Vegetation, any organic or deleterious material, topsoil and non-engineered fill should be removed from the site under pavement areas prior to aggregate placement. Based on our observations during testing, we consider the natural ground below the topsoil at the site should provide an adequate subgrade for the proposed pavement areas.

6.3 Stormwater Control

Concentrated stormwater flows from all impermeable areas must be collected and carried in sealed pipes to the Council system or an alternative disposal point subject to approval from Council. Uncontrolled stormwater must not be allowed to saturate the ground as this will potentially affect future foundation performance both statically and during future seismic activity.

6.4 Foundations

Foundations for future proposed residential dwellings within the subdivision may comprise shallow pad, strip, or slab foundations designed in accordance with the provisions of NZS 3604 Timber Framed Buildings.

Site specific testing will be required for Building Consent, to confirm the bearing materials and capacity. For preliminary design, we anticipate that a geotechnical Ultimate Bearing Capacity of 300 kPa may be assumed for foundations bearing on sandy gravel or engineered fill, below any topsoil. All topsoil shall be stripped from within building footprints, we anticipate this to be typically below 0.1 to 0.3 m depth based on our subsurface investigations.



7 References

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- The Ministry of Business, Innovation, and Employment (2016). New Zealand Geotechnical Database. Retrieved November 2019, from https://www.nzgd.org.nz.



8 Limitations

- i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Hughes Developments Ltd, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.
- ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.
- iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.
- iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.
- v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (03) 328 9012 if you require any further information.

Report prepared by

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Report reviewed by

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Principal Engineering Geologist

Jed Watts

Engineering Geologist

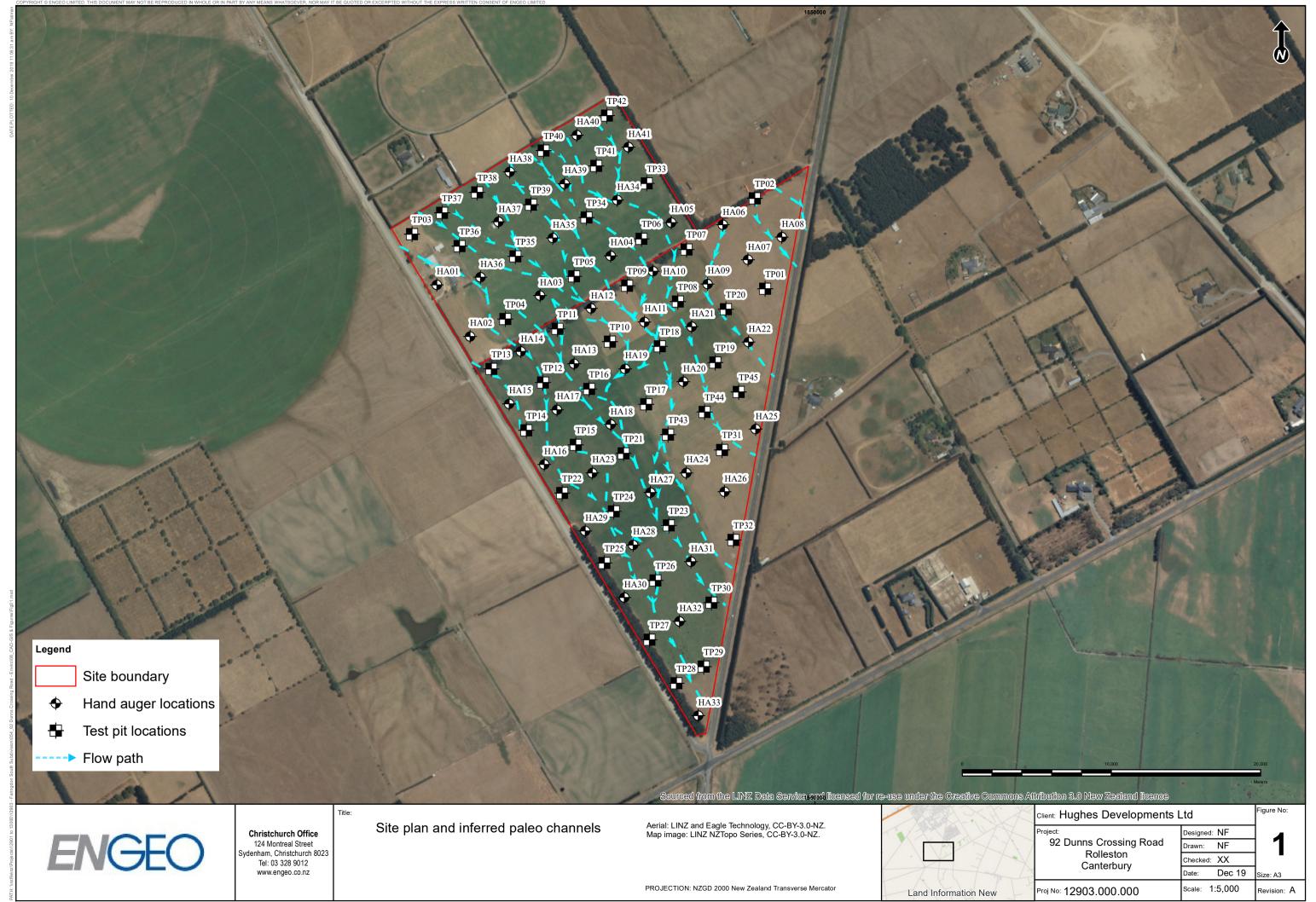




APPENDIX 1:

Site Plan and Inferred Paleo Channels





ORIGINAL FIGURE PRINTED IN COLOUR



APPENDIX 2:

ENGEO Hand Auger and Test Pit Logs





Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A Date : 22/11/2019 Hole Depth: 0.3 m

Hole Diameter: 50 mm

Logged By: KF/CR Reviewed By: JW Latitude: -43.626634

Longitude: 172.372952

Shear Vane No: 1379

Shear Vane Undrained Shear Strength (kPa) Peak/Remolded Graphic Symbol Elevation (mRL) Symbol Depth (m BGL) Moisture Cond. Consistency/ Density Index Scala Penetrometer Water Level **DESCRIPTION** Material USCS 8 Blows per 100mm 6 8 10 12 Sandy SILT with trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. Z S-F ML Sandy SILT with trace gravel; greyish brown. Low plasticity. Sand, fine. D ALLUVIUM St-H ML End of Hole Depth: 0.3 m Termination Condition: Practical refusal 0.5 GEOTECH HAND AUGER 2019:11.27 - HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 4/12/19 1.0-

Hand auger met practical refusal at 0.3 m depth on inferred gravel. Scala Penetrometer met practical refusal at 0.3 m depth. Standing groundwater was not encountered.



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

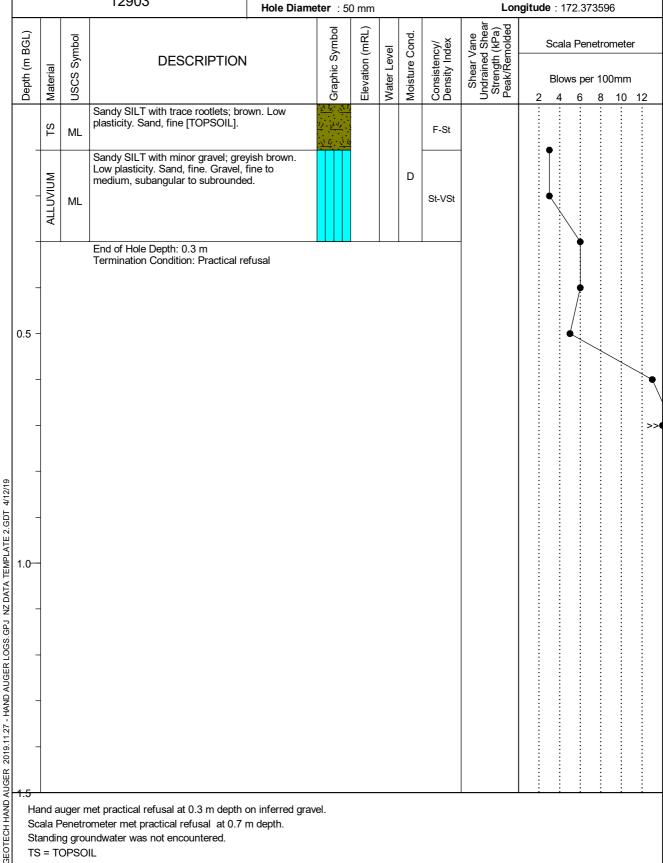
Standing groundwater was not encountered.

TS = TOPSOIL

Client: Hughes Developments Ltd Shear Vane No: 1379 Client Ref. : N/A Date : 22/11/2019 Reviewed By: JW Hole Depth: 0.3 m

Latitude: -43.627341

Logged By: KF/CR





Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A Date : 22/11/2019 Hole Depth: 0.3 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW Latitude: -43.626801

Longitude: 172.374937 Hole Diameter: 50 mm Shear Vane Undrained Shear Strength (kPa) Peak/Remolded Graphic Symbol Elevation (mRL) Symbol Depth (m BGL) Moisture Cond. Consistency/ Density Index Scala Penetrometer Water Level **DESCRIPTION** Material USCS 8 Blows per 100mm 6 8 10 12 SILT with some sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. Z S-F ML Sandy SILT with minor gravel; greyish brown. Low plasticity. Sand, fine. Gravel, fine, D ALLUVIUM subangular to subrounded. F-St ML End of Hole Depth: 0.3 m Termination Condition: Practical refusal 0.5 GEOTECH HAND AUGER 2019:11.27 - HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 4/12/19 1.0-

Hand auger met practical refusal at 0.3 m depth on inferred gravel. Scala Penetrometer met practical refusal at 0.4 m depth.

Standing groundwater was not encountered.



Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.3 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW

Latitude : -43.626238

			12903	Hole Diame			1	ı	ı	Lor		de : -4 de : 17				
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Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Shear Vane No: 1379 Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.2 m

Reviewed By: JW Latitude : -43.625776

Logged By: KF/CR

			12903	Hole Diame				ı	1	Lor		ie : -43 ie : 17			
Depth (m BGL)	_	Symbol	DESCRIPTION	I	Graphic Symbol	Elevation (mRL)	evel	Moisture Cond.	ency/ Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala	Pene	etrome	ter
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-	A	ML	Sandy SILT with trace gravel; grey Low plasticity. Sand, fine. Gravel, subangular to subrounded.	rish brown. fine,				D	St-VSt						
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Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.2 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW

Latitude: -43.625827

			12903	Hole Diame						Lor		le : 17			,	
BGL)		ymbol	DESCRIPTION	ı	Symbol	ת) (mRL)	vel	Cond.	ncy/ ndex	Vane ed Shear h (kPa) emolded		Scala	Per	netron	neter	
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Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: 1379 Client Ref. : N/A Date : 22/11/2019 Hole Depth: 0.2 m

Reviewed By: JW Latitude : -43.626312

Logged By: KF/CR

Longitude: 172.378918 Hole Diameter: 50 mm Shear Vane Undrained Shear Strength (kPa) Peak/Remolded Graphic Symbol Elevation (mRL) Symbol Depth (m BGL) Moisture Cond. Consistency/ Density Index Scala Penetrometer Water Level **DESCRIPTION** Material USCS 8 Blows per 100mm 6 8 10 12 SILT with some sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. Z F-St ML D SILT with some sand; brown. Low plasticity. Sand, fine. St-VSt ⋖ ML End of Hole Depth: 0.2 m Termination Condition: Practical refusal 0.5 GEOTECH HAND AUGER 2019:11.27 - HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 4/12/19 1.0-

Hand auger met practical refusal at 0.2 m depth on inferred gravel. Scala Penetrometer met practical refusal at 0.3 m depth.

Standing groundwater was not encountered.

TS = TOPSOIL, A = ALLUVIUM



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

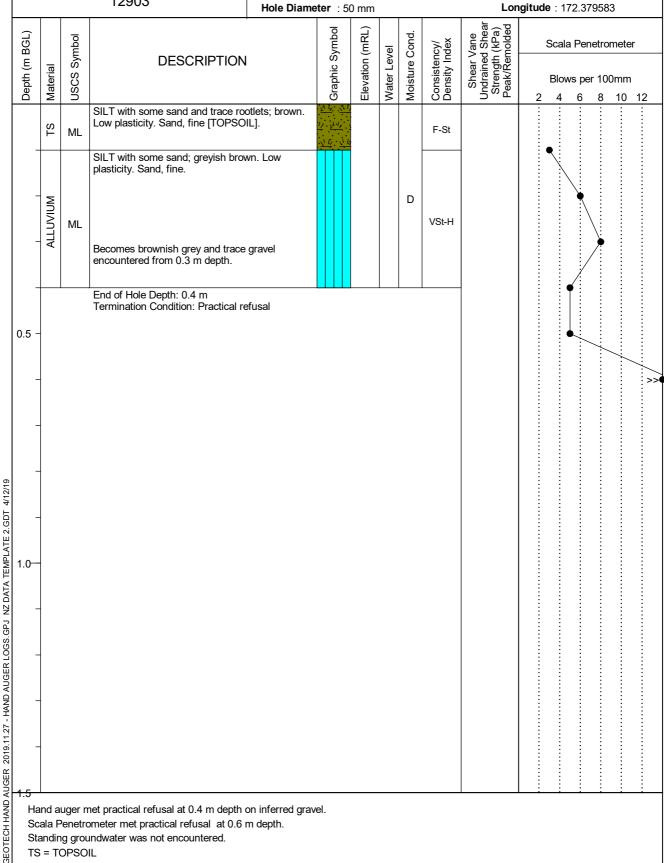
Standing groundwater was not encountered.

TS = TOPSOIL

Client: Hughes Developments Ltd Client Ref. : N/A Date : 22/11/2019 Hole Depth: 0.4 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW

Latitude: -43.626009 Longitude: 172.379583





Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A Date : 22/11/2019 Hole Depth: 0.3 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW Latitude : -43.62663

Longitude: 172.378167 Hole Diameter: 50 mm Shear Vane Undrained Shear Strength (kPa) Peak/Remolded Graphic Symbol Elevation (mRL) Symbol Depth (m BGL) Moisture Cond. Consistency/ Density Index Scala Penetrometer Water Level **DESCRIPTION** Material USCS 8 Blows per 100mm 6 8 10 12 SILT with some sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. Z St ML SILT with some sand; greyish brown. Low plasticity. Sand, fine. D ALLUVIUM St-VSt ML End of Hole Depth: 0.3 m Termination Condition: Practical refusal 0.5 GEOTECH HAND AUGER 2019:11.27 - HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 4/12/19 1.0-

Hand auger met practical refusal at 0.3 m depth on inferred gravel. Scala Penetrometer met practical refusal at 0.3 m depth. Standing groundwater was not encountered.



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.5 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW

Latitude : -43.626452

SILT with some sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. SILT with some sand; greyish brown. Low plasticity. Sand, fine. ML Trace gravel and sand observed from 0.3 m depth. End of Hole Depth: 0.5 m Termination Condition: Practical refusal	SILT with some sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. SILT with some sand; greyish brown. Low plasticity. Sand, fine. D St-VSt St-VSt				12903	Hole Diame						Lor		le : 17				
SILT with some sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. SILT with some sand; greyish brown. Low plasticity. Sand, fine. D St-VSt End of Hole Depth: 0.5 m Termination Condition: Practical refusal	SILT with some sand; greyish brown. Low plasticity. Sand, fine [TOPSOIL]. SILT with some sand; greyish brown. Low plasticity. Sand, fine. D St-VSt depth. End of Hole Depth: 0.5 m Termination Condition: Practical refusal	n BGL)		ymbol	DESCRIPTION	I	Symbol	n (mRL)	evel	Cond.	ency/ Index	r Vane ed Shear th (kPa) emolded		Scala	Pen	etrom	eter	
SILT with some sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. SILT with some sand; greyish brown. Low plasticity. Sand, fine. D St-VSt End of Hole Depth: 0.5 m Termination Condition: Practical refusal	SILT with some sand; greyish brown. Low plasticity. Sand, fine [TOPSOIL]. SILT with some sand; greyish brown. Low plasticity. Sand, fine. D St-VSt depth. End of Hole Depth: 0.5 m Termination Condition: Practical refusal	Depth (n	Material	nscs s			Graphic	Elevation	Water Le	Moisture	Consiste Density	Shear Undrain Strengt Peak/Re	2					12
D St-VSt depth. End of Hole Depth: 0.5 m Termination Condition: Practical refusal	D St-VSt depth. End of Hole Depth: 0.5 m Termination Condition: Practical refusal		TS	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSC	otlets; brown. DIL].	17 · 77·17 17 · 77·17	1)			F-St							
End of Hole Depth: 0.5 m Termination Condition: Practical refusal	End of Hole Depth: 0.5 m Termination Condition: Practical refusal	_	ALLUVIUM	ML	plasticity. Sand, fine. Trace gravel and sand observed fi					D	St-VSt							
		- 0.5 - -			End of Hole Depth: 0.5 m Termination Condition: Practical r	efusal									·····		•	
	1.0-	_																×
		-																
			-															



Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.3 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW

Latitude : -43.627174

SILT with some sand and trace roc Low plasticity. Sand, fine [TOPSOI SILT with some sand and trace grabrown. Low plasticity. Sand, fine. End of Hole Depth: 0.3 m Termination Condition: Practical re	otlets; brown. IL]. avel; greyish	S. 15. 15. 15. 15. 15. 15. 15. 15. 15. 15	Elevation (mRL)	Water Level	□ Moisture Cond.	Consistency/	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Blows I	per 10		
SILT with some sand and trace roc Low plasticity. Sand, fine [TOPSOI SILT with some sand and trace gra brown. Low plasticity. Sand, fine. IL End of Hole Depth: 0.3 m	IL]. avel; greyish	7 6 7 7 6 7 7 6 7 7 6 7 7 6 7 7 6 7	,			F-St		•	0	10	<u></u>
End of Hole Depth: 0.3 m					D	St-VSt					
End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal										
								 - : :	•		
										:	
et	rometer met practical refusal at 0.3 i	rometer met practical refusal at 0.3 m depth.		rometer met practical refusal at 0.3 m depth.					rometer met practical refusal at 0.3 m depth.		rometer met practical refusal at 0.3 m depth.



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A Date : 22/11/2019 Hole Depth: 0.3 m

Logged By: KF/CR Reviewed By: JW Latitude : -43.626972

Shear Vane No: 1379

Longitude: 172.375908 Hole Diameter: 50 mm Shear Vane Undrained Shear Strength (kPa) Peak/Remolded Graphic Symbol Elevation (mRL) Symbol Depth (m BGL) Moisture Cond. Consistency/ Density Index Scala Penetrometer Water Level **DESCRIPTION** Material USCS 8 Blows per 100mm 6 8 10 12 SILT with some sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. Z F-St ML SILT with some sand and trace gravel; greyish brown. Low plasticity. Sand, fine. D ALLUVIUM St-VSt ML End of Hole Depth: 0.3 m Termination Condition: Practical refusal 0.5 GEOTECH HAND AUGER 2019:11.27 - HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 4/12/19 1.0-

Hand auger met practical refusal at 0.3 m depth on inferred gravel. Scala Penetrometer met practical refusal at 0.3 m depth. Standing groundwater was not encountered.



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth: 0.3 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW

Latitude : -43.627741 Longitude: 172.375608 Hole Diameter : 50 mm

			12903	Hole Diame	eter : 5	0 mm				Lor	ngitude: 1	72.37	5608	
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded			etromete 100mm 8 10	<u>I</u>
		ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSO	otlets; brown. IL].	17. 21.17 17. 21.17				F-St					
- 110	ALLUVIUM	ML	Sandy SILT with minor gravel; gre Low plasticity. Sand, fine. Gravel, subangular to subrounded.	yish brown. fine,				D	St-VSt		•		,	
			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal										>
0.5 -														
0.5														
1.0														
Scala	a Pe ding	enetro g grou	net practical refusal at 0.3 m depth ometer met practical refusal at 0.3 indwater was not encountered.		el.							·	-	•



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.4 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW Latitude : -43.62757

		12903	Hole Diame	eter : 5	0 mm					ngitude	e: 172	.374	573	
Depth (m BGL) Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala F Blows			
Dep Mate)SN			Gra	⊟e	Wat	Mois	Con	S dr S	2				12
ST	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSO	otlets; brown. IL].	1/ · 1/ · 1/				S-F						
ALLUVIUM	ML	Sandy SILT with trace gravel; grey Low plasticity. Sand, fine.	ish brown.				D	St-VSt						
		End of Hole Depth: 0.4 m									:			:
		End of Hole Depth: 0.4 m Termination Condition: Practical re	efusal											
1.0-														
-														



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.5 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW

Latitude : -43.628288

			12903	Hole Diame						Lor	ngituc					
n BGL)		ymbol	DESCRIPTION	I	Symbol	ı (mRL)	evel	Cond.	ncy/ Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Sca	la Pe	enetr	romet	er
Depth (m BGL)	Material	USCS Symbol			Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Undraine Strengt Peak/Re	2				00mn	n 12
	TS	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSC	otlets; brown. IIL].	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	7). 			S-F							
_			Sandy SILT with trace gravel; green Low plasticity. Sand, fine.	yish brown.												
-	ALLUVIUM	ML	Trace gravel and becomes brown 0.3 m depth.	sh grey from				D	F-VSt				\			
0.5 -			End of Hole Depth: 0.5 m Termination Condition: Practical r	efusal						_			•			
-	-															\·····
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Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.6 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW

Latitude : -43.629139

			12903	Hole Diame	eter:5	0 mm					gituc	le : 17	2.375	002	
Depth (m BGL)	ial	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded				tromete	
epth	Material	SCS			raph	eva	Vate	/oist	cons	She Stre	_			100mm	
	TS	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSO	IL].	17 · 24 · 18 · 18 · 18 · 18 · 18 · 18 · 18 · 1		>	2	S-F		2	4	6	8 10	12
_	ALLUVIUM	ML	Sandy SILT; greyish brown. Low p fine. Becomes light greyish brown from	·				D	F-VSt		·\				
0.5 -	,		Trace gravel encountered from 0.5												
			Termination Condition: Practical re	efusal									i		<u></u>
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1.5 LI	nd a	IGOT (not practical refusal at 0.6 m don't	on informad are:	vol					<u> </u>	<u> </u>	:_	_:	: :	:
Sc	ala P	enetro	net practical refusal at 0.6 m depth of meter met practical refusal at 0.7		GI.										
Sta	andin	a arou	undwater was not encountered.												



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.3 m

 $\textbf{Logged By} : \mathsf{KF}/\mathsf{CR}$ Reviewed By: JW Latitude : -43.628389

Shear Vane No: 1379

			12903	Hole Diame						Lor	ngitude :				
BGL)		loqu/	DESCRIPTION		Symbol	(mRL)	vel	Cond.	ncy/ ndex	Vane kd Shear h (kPa) emolded	Sc	ala Per	netrome	ter	
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		lows pe	er 100m 8 10	m 0 12	2
	TS	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSO	otlets; brown. IL].	17. 21.17 17. 21.17				S-F					:	
-	ALLUVIUM	ML	Sandy SILT; greyish brown. Low pfine.					D	St-VSt		•	•			
-			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal											>>
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0.5															
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ATA TEMPLATE 2.GDT 4/12/19 0.0															
0.1 MPLATE 2.														:	
Z DATA TE															
GS.GPJ N															
NUGER LO															
7 - HAND A															
JGER 2019.11.2															
St St	cala F tandir	enetr	net practical refusal at 0.3 m depth ometer met practical refusal at 0.3 undwater was not encountered. IIL		el.					1		· ·	· ·		



Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Shear Vane No: 1379 Client: Hughes Developments Ltd Client Ref. : N/A Logged By: KF/CR **Date**: 22/11/2019 Reviewed By: JW

	12903	Hole De	pth : 0. eter : 50					Lor		le : -43 le : 17			
Depth (m BGL) Material USCS Symbol	DESCRIPTION	N	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2	Blow	s per	100mi 8 10	m
ST WI	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSC	ootlets; brown. DIL].	1/. 2/. 1/			D	F-St						
0.5 -	End of Hole Depth: 0.1 m Termination Condition: Practical r	efusal											



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.6 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW

Latitude : -43.627815

			12903	Hole Diame	eter :	50 mm					gitud	e : 17	2.376	3568	
Depth (m BGL)	rial	USCS Symbol	DESCRIPTION	N	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	;	Scala			
)eptl	Material	JSC			Grap	Eleva	Vate	Aois	Sons Jens	Stre Stre Peal	2	4	s per 6	100m 8 1	ım 0 12
	TS	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSC	ootlets; brown. DIL].	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	7), 			S-F					:	
		ML	SILT with some sand; greyish bro plasticity. Sand, fine.	wn. Low					F-St			>			
	ALLUVIUM							D							
0.5 -		ML	Sandy SILT with trace gravel; green Low plasticity. Sand, fine.	yish brown.					St-VSt						
_			End of Hole Depth: 0.6 m Termination Condition: Practical r	etusal											
1.0-															



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.3 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW

Latitude: -43.627993

			12903	Hole Diame						Lor		le : 172			
Depth (m BGL)	<u>a</u>	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala I	Penet	tromet	er
Depth	Material	nscs			Graphi	Elevati	Water Level	Moistu	Consis Densit	She Undrai Stren Peak/	2			100mn 8 10	n 12
	TS	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSO	otlets; brown. IL].	17 · 24·17 · 17 · 24·17				S-F						
_	ALLUVIUM	ML	SILT with some sand and trace gr brown. Low plasticity. Sand, fine.	avel; greyish				D	St-VSt			•	•		·····/
			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal											
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1.0-															
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-															
-															
Sca Sta	ala P andin	enetro	net practical refusal at 0.3 m depth ometer met practical refusal at 0.3 undwater was not encountered. IIL		/el.					•	•	•	•	•	•



Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Shear Vane No: 1379 Client: Hughes Developments Ltd Client Ref. : N/A Logged By: KF/CR **Date**: 22/11/2019 **Hole Depth**: 0.2 m

Reviewed By: JW I atitude : -43.627255

			12903	Hole De Hole Diame						Lor	atitude : -43 ngitude : 17			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		s per	etromete 100mn 8 10	
-	TOPSOIL	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSO					D	F-St					
=	_		End of Hole Depth: 0.2 m Termination Condition: Practical re	efusal										\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.\.
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1.0-	_													
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Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Shear Vane No: 1379 Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.3 m

Logged By: KF/CR Reviewed By: JW Latitude : -43.627454

Depth (m BGL)	 	Symbol			loqu	(L)				ed _ ed _					
_ ' '	Material	uscs s	DESCRIPTION	1	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2		s per	100mn 8 10	
,	TS	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSC	otlets; brown. IL].			_	_	F-St	_	:	- 1	<u>.</u> 	<u> </u>	12
	ALLUVIUM	ML	SILT with some sand and trace gr brown. Low plasticity. Sand, fine.	avel; greyish				D	St-VSt			•			
			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal											
0.5 -															
1.0-															



Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.3 m

Logged By: KF/CR Reviewed By: JW Latitude: -43.629267

Shear Vane No: 1379

			12903	Hole Diame						Lor		de : -43 de : 172			
Depth (m BGL)	rial	USCS Symbol	DESCRIPTION	I	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala			
Deptl	Material	SSN			Grap	Eleva	Wate	Mois	Cons Dens	Sh Undr Stre Peal	2			100mr 3 10	n) 1 <u>2</u>
	TS	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSO	otlets; brown. IL].	7 6 7 6 17 3 17 3				S-F						
_	ALLUVIUM	ML	Sandy SILT with trace gravel; brown plasticity. Sand, fine.	vn. Low				D	St-VSt						
_			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal											:
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0.5 -															
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1.0															
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-															
Sca	ala P andin	enetro g grou	net practical refusal at 0.3 m depth ometer met practical refusal at 0.3 undwater was not encountered.		el.								<u>:</u> : : :		_



Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth: 0.3 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW

Latitude: -43.629275

			12903	Hole De Hole Diame							atitude : - ngitude : 1			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded			etrometo	n
_	TS	ML	SILT with some sand and trace roo Low plasticity [TOPSOIL].	otlets; brown.	1/2 · 2/4 · 1/2 · 1/4 ·				S-F			- 	0 10	
-	ALLUVIUM	ML	Sandy SILT with minor gravel; broplasticity. Sand, fine. Gravel, fine, subrounded.	wn. Low subangular to				D	St-VSt					······································
-			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal			1							
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1.0-														
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Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Client : Hughes Developments Ltd Shear Vane No : 1379 Client Ref. : N/A Date : 22/11/2019
Hole Depth : 0.1 m

Logged By: KF/CR Reviewed By : JW

			12903	Hole De Hole Diame						Lor		de : -4 de : 17			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2	Blow		etrome 100m 8 1	
	TS	ML	SILT with some sand and trace roo Low plasticity [TOPSOIL].	otlets; brown.	17. 21.17.			D	F-St				:		
0.5 -			End of Hole Depth: 0.1 m Termination Condition: Practical re	efusal											<i></i>
Scal Star	la P	enetro	net practical refusal at 0.1 m depth of the practical refusal at 0.5 muster met practical refusal at 0.5 muster was not encountered.		rel.										



Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Shear Vane No: 1379 Client: Hughes Developments Ltd Client Ref. : N/A $\textbf{Logged By} : \mathsf{KF}/\mathsf{CR}$ Date : 22/11/2019 Reviewed By: JW

Hole Depth: 0.2 m Latitude : -43.629562

			12903	Hole Diam	epth: 0. eter: 50					Lor		de : -43 de : 17			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2		s per	100mi	
	TOPSOIL	ML	SILT with some sand and trace gra Low plasticity. Sand, fine [TOPSO	IL].				D	F-St			•			J 1.
+			End of Hole Depth: 0.2 m Termination Condition: Practical re	fusal	<i>i: \\ii</i> ;							•			
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0.5 -															
-															
1.0-															
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4															



Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A Date : 22/11/2019

Shear Vane No: 1379 $\textbf{Logged By} : \mathsf{KF}/\mathsf{CR}$ Reviewed By: JW

			Rolleston 12903	Hole De Hole Diame	pth : 0. eter : 50	.1 m				L Lor	atitude : -	43.6			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		ows p	per 1	romet 00mn 3 10	n
_	TS	ML	SILT with some sand, trace gravel brown. Low plasticity. Sand, fine [and rootlets; ΓΟΡSOIL].	17 · 34·14 · ·			D	S-F					10	-12
- - - 0.5 - -			End of Hole Depth: 0.1 m Termination Condition: Practical re	rfusal	<u> </u>										
- 1.0 - -															
Sc Sta	ala P andin	enetro	net practical refusal at 0.1 m depth o ometer met practical refusal at 0.3 i undwater was not encountered.		el.										



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Shear Vane No: 1379 Client: Hughes Developments Ltd Client Ref. : N/A Logged By: KF/CR **Date**: 22/11/2019 Reviewed By: JW Hole Depth : 0.2 m

Latitude : -43.630284

			12903	Hole Diame	eter:5	0 mm					gitude: 172.37670	02
BGL)		ymbol	DESCRIPTION	•	Symbol	ı (mRL)	vel	Cond.	ncy/ ndex	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetro	ometer
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Undraine Strengt Peak/Re	Blows per 10 2 4 6 8	
	TS	ML	SILT with some sand and trace rou Low plasticity. Sand, fine [TOPSO	otlets; brown. IL].	17. 21.17 17. 21.17				S-F			
_	4	ML	Sandy SILT with trace gravel; brov Low plasticity. Sand, fine.	vnish grey.				D	VSt-H		•	
-			End of Hole Depth: 0.2 m Termination Condition: Practical re	efusal								>
-												
_	_											
0.5 -												
_												
_												
-												
_												
1.0	1											
-												
-												
_												
_												
Sc Sta	ala F andin	enetro g grou	net practical refusal at 0.2 m depth ometer met practical refusal at 0.2 undwater was not encountered.		el.							



Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Shear Vane No: 1379 Client: Hughes Developments Ltd Client Ref. : N/A Logged By: KF/CR **Date**: 22/11/2019 Reviewed By: JW

Hole Depth : 0.2 m Latitude: -43.630074

			12903	Hole Diame						Lor	gitude				
Depth (m BGL)	al	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded				omete	
Depth	Material	SOSN			Graph	Elevat	Water	Moistu	Consis Densit	She Undra Strer Peak/	2		per 1	00mm 10	
	TS	ML	SILT with some sand and trace round Low plasticity. Sand fine [TOPSOI	otlets; brown. L].	17 - 31 14 - 31 17 - 31 14 - 31 17							_ :			
	4	ML	Sandy SILT with trace gravel; brow plasticity. Sand, fine.	vn. Low								•			/
_			End of Hole Depth: 0.2 m Termination Condition: Practical re	efusal											7
_															>
_															
0.5 -															
-															
_															
_															
1.0-															
_															
-														:	
_															
Sca Sta	ala F andin	enetro g grou	net practical refusal at 0.2 m depth of practical refusal at 0.3 mometer met practical refusal at 0.3 momenter was not encountered. JIL, A = ALLUVIUM		el.										



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A Date : 22/11/2019 Hole Depth: 0.4 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW Latitude : -43.63101

Longitude: 172.376531 Hole Diameter: 50 mm Shear Vane Undrained Shear Strength (kPa) Peak/Remolded Graphic Symbol Elevation (mRL) Symbol Depth (m BGL) Moisture Cond. Consistency/ Density Index Scala Penetrometer Water Level **DESCRIPTION** Material USCS 8 Blows per 100mm 6 8 10 12 SILT with some sand and trace rootlets; brown. Low plasticity. Sand fine [TOPSOIL]. Z S-F ML Sandy SILT with minor gravel; greyish brown. Low plasticity. Sand, fine. Gravel, fine to medium, subangular to subrounded. D St-VSt ML End of Hole Depth: 0.4 m Termination Condition: Practical refusal 0.5 GEOTECH HAND AUGER 2019:11.27 - HAND AUGER LOGS.GPJ NZ DATA TEMPLATE 2.GDT 4/12/19 1.0-

Hand auger met practical refusal at 0.4 m depth on inferred gravel. Scala Penetrometer met practical refusal at 0.3 m depth. Standing groundwater was not encountered.



Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.3 m

Logged By: KF/CR Reviewed By: JW Latitude: -43.630521

Shear Vane No: 1379

SILT with some sand and trac Low plasticity. Sand fine [TOF Low plasticity. Sand, fine.] Sandy SILT with trace gravel; Low plasticity. Sand, fine. ML End of Hole Depth: 0.3 m Termination Condition: Practic	ce rootlets; brown. PSOIL]. greyish brown.	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	т Consistency/ Ф Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded			etromet 100mr 8 10	
ML SILT with some sand and trac Low plasticity. Sand fine [TOF Sandy SILT with trace gravel; Low plasticity. Sand, fine. ML End of Hole Depth: 0.3 m	greyish brown.	17 · 34 · 17 · 3						•			
Low plasticity. Sand, fine. ML End of Hole Depth: 0.3 m					Ī			. €.	:	: :	
End of Hole Depth: 0.3 m Termination Condition: Praction	cal refusal				D	St-H					
9	enetrometer met practical refusal at	enetrometer met practical refusal at 0.3 m depth. g groundwater was not encountered.		enetrometer met practical refusal at 0.3 m depth.	enetrometer met practical refusal at 0.3 m depth.						



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 22/11/2019 Hole Depth : 0.3 m

Shear Vane No: 1379 Logged By: KF/CR Reviewed By: JW

Latitude : -43.631356

			12903	Hole Diame	eter : 50						gitude	: 172	.3775	666	
Depth (m BGL)	al	USCS Symbol	DESCRIPTION	I	Graphic Symbol	Elevation (mRL)	Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded				romete	
Depth	Material	nscs				Elevati	Water Level	Moistu	Consis	She Undrai Stren Peak/	2		per 1	00mn 3 10	າ 12
	TS	ML	SILT with some sand and trace ro Low plasticity. Sand fine [TOPSO	ootlets; brown. IL].	1/2 · 2/4 · 1/2 ·				S-F						
_	ALLUVIUM	ML	Sandy SILT with trace gravel; gre Low plasticity. Sand, fine.	yish brown.				D	St-VSt						<u> </u>
			End of Hole Depth: 0.3 m Termination Condition: Practical r	efusal											:
-															
0.5 -															
-															:
-															
1.0-															
1.0															
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Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A Date : 22/11/2019 Hole Depth: 0.6 m

Shear Vane No: 1379 $\textbf{Logged By} : \mathsf{KF}/\mathsf{CR}$ Reviewed By: JW

Latitude: -43.632691

DESCRIPTION ILT with some sand and trace room plasticity. Sand fine [TOPSOI	otlets: brown.	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Penet vs per		1
ILT with some sand and trace roow plasticity. Sand fine [TOPSOI	otlets; brown. L].	1/2 · 3/4 · 3/4 · 3/4 ·	E					- 4		10	-12
LT with some sand and trace rootlets; brown. w plasticity. Sand fine [TOPSOIL].		<u> </u>			_	F-St		•	•		
andy SILT with trace gravel; grey ow plasticity. Sand, fine.	n depth.				D	VSt-H					
ubrounded. nd of Hole Depth: 0.6 m											
	ravel, fine to medium, subangula ibrounded. nd of Hole Depth: 0.6 m		ravel, fine to medium, subangular to abrounded.	ravel, fine to medium, subangular to abrounded.	ravel, fine to medium, subangular to abrounded.	ravel becomes minor from 0.5 m depth. ravel, fine to medium, subangular to abrounded. Ind of Hole Depth: 0.6 m	ravel becomes minor from 0.5 m depth. ravel, fine to medium, subangular to abrounded.	ravel becomes minor from 0.5 m depth. ravel, fine to medium, subangular to abrounded. Ind of Hole Depth: 0.6 m	ravel becomes minor from 0.5 m depth. ravel, fine to medium, subangular to abrounded. Ind of Hole Depth: 0.6 m	ravel becomes minor from 0.5 m depth. ravel, fine to medium, subangular to abrounded. Ind of Hole Depth: 0.6 m	ravel becomes minor from 0.5 m depth. ravel, fine to medium, subangular to abrounded. Ind of Hole Depth: 0.6 m



Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 06/12/2019 Hole Depth : 0.3 m

Shear Vane No: 1379 $\textbf{Logged By} : \mathsf{KF}/\mathsf{MK}$ Reviewed By: JW

Latitude: -43.625477

			12903	Hole Diame	eter:5					Lor	gitude :		3764	21	
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	N	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	В	lows	per 10	omete	l
Δ	TOPSOIL M	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPS0	potlets; brown. DIL].	D \\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		M	Σ	ÖΔ F-St		2	4 6	8	10	12
_	ALLUVIUM	ML	Sandy SILT with trace gravel; gre Low plasticity. Sand, fine.	yish brown.	,r, ,			D	St-H			•		•	······
_			End of Hole Depth: 0.3 m Termination Condition: Practical r	refusal											
0.5 -	_														
_															
_														:	:
-															
- 1.0—															
- 1.0 															



Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A **Date**: 06/12/2019 **Hole Depth**: 0.1 m

Shear Vane No: 1379 $\textbf{Logged By} : \mathsf{KF}/\mathsf{MK}$ Reviewed By : JW

Material Woods Symbol	DESCRIPTION SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSC] End of Hole Depth: 0.1 m Termination Condition: Practical ro	ootlets; brown. DIL].		Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2		s per	100m	ım
	Low plasticity. Sand, fine [TOPSC	DIL].	1/ · 2 · 1/ · · · · · · · · ·	1	_	_	1		Scala Penetrometer Blows per 100mm 2 4 6 8 10				-
	End of Hole Depth: 0.1 m Termination Condition: Practical r	efusal				D	F-St		•				
			J. 2			1							
			auger met practical refusal at 0.1 m depth on inferred grav										



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client : Hughes Developments Ltd Client Ref. : N/A **Date**: 06/12/2019

Shear Vane No: 1379 $\textbf{Logged By} : \mathsf{KF}/\mathsf{MK}$ Reviewed By: JW

Hole Depth : 0.3 m Latitude : -43.626541

Depth (m BGL)		loqu		•	loc	-				ar) d				
)eb	Material	USCS Symbol	DESCRIPTION	N	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Blows	Penetro	00mm	
	TOPSOIL	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSC	ootlets; brown. DIL].		Ш	>	2	F-St	ו	2 4	6 8	10	12
	ALLUVIUM	ML	Sandy SILT with minor gravel; gre Low plasticity. Sand, fine. Gravel, subangular to subrounded.	eyish brown. fine,				D	VSt-H					
			End of Hole Depth: 0.3 m Termination Condition: Practical r	efusal										
0.5 -														
_														
1.0														



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A Date : 06/12/2019 Hole Depth : 0.4 m

Shear Vane No: 1379 $\textbf{Logged By} : \mathsf{KF}/\mathsf{MK}$ Reviewed By: JW

Latitude : -43.625788

BGL)					eter : 5	0 mm					gitude : 172.374136				
۔ ا ع	_	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	evel.	Moisture Cond.	ency/ Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala	Pene	trome	ter
Depth (m BGL)	Material	nscs a				Elevatic	Water Level	Moistur	Consistency/ Density Index	Shea Undrair Streng Peak/R	2	Blow 4		100mi	m) 12
	TOPSOIL	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSC	ootlets; brown. DIL].	1/ · ½ · ½ · ½ · ½ · ½ · ½ · ½ · ½ · ½ ·				F-St						
	ALLUVIUM	ML	Sandy SILT with trace gravel; green Low plasticity. Sand, fine. Gravel becomes minor from 0.3 in Gravel, fine, subrounded to round		Er X Iz			D	VSt-H					*	
			End of Hole Depth: 0.4 m Termination Condition: Practical r	efusal											
0.5															
_															
_															
-															
1.0-															
_															



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client : Hughes Developments Ltd Client Ref. : N/A Date : 06/12/2019 Hole Depth : 0.4 m

Shear Vane No: 1379 $\textbf{Logged By} : \mathsf{KF}/\mathsf{MK}$ Reviewed By: JW

Latitude: -43.625065

			12903	Hole Diame	eter:5	0 mm					gitud	gitude : 172.374372				
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	ı	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala F				
Dept	Mate	OSO			Grap	Elev	Wate	Mois	Cons	Str. Str. Pea	2		6 8		' 12	
-	TOPSOIL	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSC	otlets; brown. NL].					F-St			•				
+			Sandy SILT with trace gravel; grey	yish brown.				D					7			
-	ALLUVIUM	ML	Low plasticity. Sand, fine.						St-VSt						·····	
1			End of Hole Depth: 0.4 m Termination Condition: Practical re	efusal												
0.5																
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_															:	
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1.0-												:				
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												•				
											L :		•	<u>:</u>	_ <u>:</u>	
			net practical refusal at 0.4 m depth ometer met practical refusal at 0.4		∕el.											



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Shear Vane No: 1379 Client: Hughes Developments Ltd Client Ref. : N/A $\textbf{Logged By} : \mathsf{KF}/\mathsf{MK}$ Date : 06/12/2019 Reviewed By: JW Hole Depth : 0.2 m Latitude: -43.625291

			12903	Hole Diame						Lor		le : 172			
BGL)		ymbol	DESCRIPTION	1	Symbol	(mRL)	level	Cond.	ncy/ ndex	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala	Pene	tromet	er
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	•	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Undraine Strengt Peak/Re	2			100mr 8 10	n 12
	TOPSOIL	ML	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSC	otlets; brown. DIL].	1/ · ½· · ½ · ½ ·	2			F-St						
_	4	ML	Sandy SILT with trace gravel; green Low plasticity. Sand, fine.	yish brown.				D	VSt-H						
=			End of Hole Depth: 0.2 m Termination Condition: Practical r	efusal										*	
-															>
-															
0.5 -															
-															
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	1										:	:	:	: :	
1.0-															
1.0— Harse	-														



Geotechnical Investigation 92 Dunns Crossing Road Rolleston

Client: Hughes Developments Ltd Client Ref. : N/A Date : 06/12/2019 Hole Depth : 0.4 m

Shear Vane No: 1379 $\textbf{Logged By} : \mathsf{KF}/\mathsf{MK}$ Reviewed By: JW

Latitude: -43.624561

ngitude: 172.375659	gitude : -4	Lon						Hole Diame	12903			
Scala Penetrometer		Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Consistency/ Density Index	Moisture Cond.	Water Level	Elevation (mRL)	Graphic Symbol	I	DESCRIPTION	USCS Symbol	al	Depth (m BGL)
Blows per 100mm 2 4 6 8 10		She Undra Strer Peak/	Consis Densit	Moist	Water	Elevat	Graph			nscs	Material	Depth
•	•		F-St				1/2 3/2 1/2 3/2 1/2 3/2 1/2 3/2 1/2 3/2 1/2 3/2 1/2 3/2	otlets; brown. DIL].	SILT with some sand and trace ro Low plasticity. Sand, fine [TOPSO	МL	TOPSOIL	-
		-		D				rootlets;	Sandy SILT with trace gravel and greyish brown. Low plasticity. San			-
			VSt-H						No rootlets encountered from 0.3	ML	ALLUVIUM	-
								efusal	End of Hole Depth: 0.4 m Termination Condition: Practical re			-
).5 -
												-
												_
												_
												-
												1.0-
												_
							el.		met practical refusal at 0.4 m depth ometer met practical refusal at 0.4			



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Client Ref. : N/A Date : 06/12/2019 Hole Depth: 0.2 m

 $\textbf{Logged By} : \mathsf{KF}/\mathsf{MK}$ Reviewed By: JW Latitude : -43.624739

Shear Vane No: 1379

			12903	Hole Diame						Lor	gitud	le : 17			
n BGL)		symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	evel	e Cond.	ency/ Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala	Pene	tromet	er
Depth (m BGL)	Material	USCS Symbol				Elevatio	Water Level	Moisture Cond.	Consistency/ Density Index	Shea Undrain Streng Peak/R	2		•	100mn 8 10	າ 12
	TOPSOIL	ML	SILT with some sand, trace gravel brown. Low plasticity. Sand, fine [and rootlets; ΓΟΡSΟΙL].	17 · 3 · 14 · 3 · 6				St-VSt						
_	∢	ML	Sandy SILT with trace gravel and greyish brown. Low plasticity. San	rootlets; d, fine.	// ₂ \ \ /; . \			D	VSt-H						
_			End of Hole Depth: 0.2 m Termination Condition: Practical re	efusal										×	
_															•
_	_														>
0.5 -	-														
_															
_															
_															
_															
1.0—															
_	-														
Sc:	ala F andin	enetro	net practical refusal at 0.2 m depth oneter met practical refusal at 0.4 undwater was not encountered.		el.										



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd Shear Vane No: N/A
Date: 25/11/2019 Logged By: KF
Max Test Pit Depth: 2 m Reviewed By: JW

Digger Type/Size: 24 Tonne

Bucket Type/Size: Bucket Excavator

Latitude: -43.626724

Longitude: 172.37925

Shear Vane Peak/Remolded (kPa) Excavatability Graphic Symbol Scala Penetrometer Depth (m BGL) Symbol Elevation (mRL) Moisture Cond. Consistency/ Density Index (Relative Scale) Water Level **DESCRIPTION** Material Blows per 100mm Harder uscs : Easier 4 6 8 10 12 Sandy SILT with trace gravel and rootlets; М F-St ML brown. Low plasticity. Sand, fine [TOPSOIL]. Sandy fine to medium GRAVEL with some silt and trace rootlets; greyish brown with orange mottles. Well graded, subangular to subrounded. Sand, fine. 0.5 Silt becomes trace and no rootlets from 0.5 m depth. Trace cobbles encountered from 0.9 m depth. MD-D GW Cobbles become minor from 1.3 m depth. 1.5 Depth of Excavation: 2 m Termination Condition: Target depth

Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019;11:27 - TEST PIT LOGS:GPJ NZ MASTER DATA TEMPLATE:GDT 4/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client : Hughes Developments Ltd Shear Vane No : N/A
Date : 25/11/2019 Logged By : KF
Max Test Pit Depth : 2 m Reviewed By : JW

Digger Type/Size: 24 Tonne

Bucket Type/Size: Bucket Excavator

Reviewed by 1044

Latitude: -43.625528

Longitude: 172.379116

				Buoket Typeroize : B		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					=		
Depth (m BGL)	Material	Excavatability (Relative Scale)	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blows	enetrometer per 100mm	
	TS	ш т	ML	SILT with some sand and tree roots; light brownish grey. Low plasticity. Sand, fine [TOPSOIL].	9	Ш	>	ν	F-St	ш.	2 4 6	8 10 12	<u>'</u>
- 0.5 -				Sandy fine to coarse GRAVEL with some silt and trace rootlets; brownish grey. Well graded, subangular to subrounded. Sand, fine to medium.	XX			D					»>•
-				Trace cobbles and silt encountered from 0.6 m depth.	XX								
1.0-	ALLUVIUM		GW	No rootlets observed from 1.0 m depth.	N X X				MD-D				
1.5 -				Cobbles become minor from 1.6 m depth.				М					
2.0-			J	Depth of Excavation: 2 m Termination Condition: Target depth									

Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019.11.27 - TEST PIT LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 4/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 25/11/2019 Logged By: KF Max Test Pit Depth : 1.9 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: -43.625939 Bucket Type/Size : Bucket Excavator Longitude: 172.372464

						Bucket Type/Size	DUCKEL L	.xcavai	LOI			Longitude	. 1/2		404		
Depth (m BGL)	Material	Exca Rela (Rela	avatal tive S	y (elid Harder Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo	ows	eneti per 1		nm
-	TOPSOIL				ML	Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].				D	St-VSt		•	•			
0.5 -					SM	Silty fine to medium SAND with some gravel and trace rootlets; greyish brown. Well graded. Gravel, fine to medium, subangular to subrounded.					MD-D				•	\	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
- 1.0 - - -	ALLUVIUM					Sandy fine to coarse GRAVEL with trace silt; grey. Well graded, subangular to subrounded. Sand, fine to coarse.	TX XX			М							
- 1.5 - - -					GW	Trace cobbles encountered from 1.7 m depth.					MD-D						
2.0			•	•		Depth of Excavation: 1.9 m Termination Condition: Target depth											
Scal	la Pe	enetro	omete	depther met	pract	ical refusal. No t encountered.	ticeable	sand i	incre	ease	from 0.8	m depth.					



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 25/11/2019 Logged By: KF Max Test Pit Depth : 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude : -43.6271 Longitude: 172.374267 Bucket Type/Size : Bucket Excavator

						Bucket Type/Size .	Ducket L	Acceva	LOI			Longitude	. 17.	2.07	7201		
Depth (m BGL)	Material	Easier (slad)	cavatal ative S	y (elbo Harder Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)		ows	Pener	100n	
-	TS				ML	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].	17 : 34.14			D	F-St		•	\			
-					GW	Sandy fine to medium GRAVEL with some silt and trace rootlets; greyish brown. Well graded, subangular to subrounded.					MD-D				,	<u></u>	/^
0.5 -					SM	Silty fine to medium SAND with minor gravel; greyish brown. Well graded. Gravel, fine to medium, subangular to subrounded.					MD-D						
1.0	ALLUVIUM					Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subangular to subrounded. Sand, fine to coarse.				M							
- 1.5 - - -					GW						MD-D						
2.0						Depth of Excavation: 2 m Termination Condition: Target depth											
Sca	la Pe	enetr	target	r met	practi	ical refusal. TS	S = TOP:	SOIL sand i	incre	ease :	from 0.9	m depth.					



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client : Hughes Developments Ltd Shear Vane No : N/A
Date : 25/11/2019 Logged By : KF
Pit Depth : 1.8 m Reviewed By : JW

Max Test Pit Depth: 1.8 mReviewed By : JWDigger Type/Size: 24 TonneLatitude : -43.626522Bucket Type/Size: Bucket ExcavatorLongitude : 172.375592

						Buoket Type/Gize : B	donot L	nouva					. 112.0100	02
Depth (m BGL)	Material	Easier (Pasier	cavatabili ative Sca	Harder (ale)	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)		netrometer er 100mm 8 10 12
-	TS				ML	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].				D	F-St		•	
0.5						Sandy fine to coarse GRAVEL with some silt and trace rootlets; greyish brown. Well graded, subangular to subrounded. Sand, fine to medium.	S S S							\/\^
-						Trace cobbles and silt encountered from 0.6 m depth.								
1.0-	ALLUVIUM				GW	No rootlets observed from 0.9 m depth.				M	MD-D			
1.5						Becomes grey from 1.4 m depth.								
: !						Cobbles become minor from 1.7 m depth.	X							
2.0-			•			Depth of Excavation: 1.8 m Termination Condition: Target depth			1					

Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019.11.27 - TEST PIT LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 4/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 25/11/2019 Logged By: KF Max Test Pit Depth : 1.9 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude : -43.626028 **Longitude**: 172.376879 Bucket Type/Size : Bucket Excavator

				120		Bucket Type/Size :	Bucket E	xcava	tor			Longitude	: 17	2.3	768	79		
Depth (m BGL)	Material	Easier Slessier	avatal ative S	bility Scale) Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Е	low	Pen s per	r 10	0mn	n
	TS		:	<u>+</u>	ML	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].	17 . 34.14	ш	>	D	F-St		:	4	6	8	10	12
0.5 -						Sandy fine to coarse GRAVEL with some silt and trace rootlets; greyish brown. Well graded, subangular to subrounded. Sand, fine to medium. No silt encountered from 0.4 m depth.									•			/.Ā
1.0-	ALLUVIUM				GW	Cobbles become minor from 0.9 m depth. Sand becomes some from 1.2 m depth.				M	MD-D							
- 1.5 - - -						No rootlets observed from 1.6 m depth.												
2.0-						Depth of Excavation: 1.9 m Termination Condition: Target depth												
Scal	la Pe	enetro	arget omete	r met	pract	ical refusal. TS t encountered.	S = TOPS	SOIL										



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 25/11/2019 Logged By: KF

Max Test Pit Depth : 1.8 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude : -43.626164 Bucket Type/Size : Bucket Excavator **Longitude**: 172.377786

						Bucket Type/Size .	DUCKEL L	λιαναι	.UI				\$. 1/2.3///00
Depth (m BGL)	Material	Easier Rela Sier	avatal ative S	Harder Harder Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm 2 4 6 8 10 12
-	TS				ML	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].	17. 37.17. 17. 37.17.			D	F-St		•
0.5 -						Sandy fine to coarse GRAVEL with some silt and trace cobbles; greyish brown. Well graded, subangular to subrounded. Sand, fine to medium. Cobbles become minor from 0.6 m depth.							
1.0-	ALLUVIUM				GW	Sand becomes some from 0.8 m depth.				М	MD-D		
1.5 -						Donth of Everyation: 1.9 m							
2.0						Depth of Excavation: 1.8 m Termination Condition: Target depth							
Scala	la Pe	enetro	arget omete undwa	r met	pract	ical refusal. TS	s = TOPS	SOIL					



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 25/11/2019 Logged By: KF Reviewed By: JW

Max Test Pit Depth : 1.8 m Digger Type/Size : 24 Tonne Latitude : -43.626906 Longitude: 172.377587

				129	03	Bucket Type/Size : I			tor			Longitude			
Depth (m BGL)	Material	Easier BleS)	avatal tive S	Harder (aleog	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	ala Poos p	oer 1	m
_	TS				ML	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].	17. 31.14			D	F-St		•		
0.5 -						Sandy fine to coarse GRAVEL with some silt, trace cobbles and rootlets; greyish brown. Well graded, subangular to subrounded. Sand, fine to coarse. No rootlets observed from 0.4 m depth.									\ \hat{\delta}
- 1.0 - -	ALLUVIUM				GW	Becomes grey and some sand from 1.2 m depth.				M	MD-D				
- 1.5 - - -						Double of Espansions 4.0 m						-			
2.0						Depth of Excavation: 1.8 m Termination Condition: Target depth									:
_															 - -
Sca	la Pe	met ta	mete	r met	pract	ical refusal. TS	s = TOPS	SOIL							



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd Shear Vane No: N/A
Date: 25/11/2019 Logged By: KF
it Depth: 2 m Reviewed By: JW

Max Test Pit Depth: 2 mReviewed By: JWDigger Type/Size: 24 TonneLatitude: -43.626677

Longitude: 172.376622 Bucket Type/Size : Bucket Excavator Shear Vane Peak/Remolded (kPa) Excavatability Graphic Symbol Scala Penetrometer Depth (m BGL) Symbol Elevation (mRL) Moisture Cond. Consistency/ Density Index (Relative Scale) Water Level **DESCRIPTION** Material Blows per 100mm Harder JSCS : Easier 6 8 10 12 Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. \mathbf{S} F-St MLSandy fine to medium GRAVEL with some silt and trace rootlets; greyish brown. Well graded, subangular to subrounded. Sand, fine to medium. 0.5 No silt encountered from 0.6 m depth. Trace cobbles encountered from 0.8 m depth. MD-D GW M 1.5 Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subangular to subrounded. Sand, fine to coarse. MD-D GW Depth of Excavation: 2 m Termination Condition: Target depth

Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019;11:27 - TEST PIT LOGS:GPJ NZ MASTER DATA TEMPLATE:GDT 4/12/19

TS = TOPSOIL

Noticeable sand increase from 1.7 m depth.



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd: Shear Vane No: N/A
Date: 25/11/2019
Logged By: KF

Max Test Pit Depth: 1.9 mReviewed By : JWDigger Type/Size: 24 TonneLatitude : -43.627457Bucket Type/Size: Bucket ExcavatorLongitude : 172.376289

						Bucket Type/Size . D	ucket L	лсаvа	LOI			Longitude	F. 172.370209
Depth (m BGL)	ial	(Rel	cavatabil lative Sc	ale)	Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm
Depth	Material	Easier		Harder	nscs		Grapł	Eleva	Wate	Moist	Cons	Sh Peak	2 4 6 8 10 12
	TOPSOIL				ML	Sandy SILT with trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].				D	St-VSt)
0.5						Sandy fine to coarse GRAVEL with trace silt; greyish brown. Well graded, subangular to subrounded. Sand, fine to coarse.							***
1.0-	-					No silt and trace cobbles encountered from 0.6 m depth.							
	ALLUVIUM				GW	Sand becomes some from 1.0 m depth.				M	MD-D		
1.5	-												
2.0-						Depth of Excavation: 1.9 m Termination Condition: Target depth	X						

Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019.11.27 - TEST PIT LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 4/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd Shear Vane No: N/A

Date: 26/11/2019 Logged By: KF

it Donth: 1.9 m

Reviewed By: IW

Max Test Pit Depth: 1.9 mReviewed By : JWDigger Type/Size: 24 TonneLatitude : -43.627275Bucket Type/Size: Bucket ExcavatorLongitude : 172.375259

								Bucket Type/Size	JUCKEL L	лоача	LOI			Longitude	F. 172.373	233	
Depth (m BGL)	,	Material	Easier B)	cavatab ative S	y (ellic Harder Harder	USCS Symbol	DES	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Pe	er 100	
		TS L			:	ML		and, trace gravel and ow plasticity. Sand, fine					F-St				
	I					GW	, some silt and trac	dium GRAVEL with ce rootlets; greyish	3			D	MD-D				
0.5						ML		ed, subangular to d, fine to medium. and and trace gravel; ow plasticity. Sand, fine.					St-VSt				•
1.0		ALLUVIUM				GW	silt; greyish brown Well graded, suba Sand, fine to med No silt encountered Sand becomes findepth. Trace cobbles encountered	rse GRAVEL with some in with orange mottles, angular to subrounded, lium. ed from 0.8 m depth. The to coarse from 1.0 m countered from 1.2 m				М	MD-D				*
2.0							Depth of Excavation Termination Cond	on: 1.9 m dition: Target depth									

Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019.11.27 - TEST PIT LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 4/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 26/11/2019 Logged By: KF

Max Test Pit Depth : 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: -43.628017 **Longitude**: 172.374975 Bucket Type/Size : Bucket Excavator

						Bucket Type/Size . b	ucket L	лсаvа	LOI			Longitud	5 . 17.	2.51	491	1	
Depth (m BGL)	Material	Easier Sloy	avatab ative S	oility cale) Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)		ows		rometo	m
	TS			i	ML	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].	7				F-St			•			-
-					GW	Fine to medium GRAVEL with some sand, silt and trace rootlets; greyish brown. Well graded, subangular to subrounded. Sand, fine.				D	MD-D						
0.5 -						Sandy fine to coarse GRAVEL with trace rootlets; grey. Well graded, subangular to subrounded. Sand, fine to coarse.											۸
-	Σ					No rootlets observed from 0.8 m depth.	以			М							
1.0	ALLUVIUM					Trace cobbles encountered from 1.0 m depth.	X										
-					GW						MD-D						
1.5 - - -						Cobbles become minor from 1.5 m depth.				W							
2.0-						Depth of Excavation: 2 m Termination Condition: Target depth	X										
														.	•	·	-
Sca	la Pe	enetr	arget ometer	r met	pract	ical refusal. TS t encountered.	= TOPS	SOIL									_



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd Shear Vane No: N/A

Date: 26/11/2019 Logged By: KF
t Depth: 2 m Reviewed By: JW

Max Test Pit Depth: 2 mReviewed By : JWDigger Type/Size: 24 TonneLatitude : -43.627819Bucket Type/Size: Bucket ExcavatorLongitude : 172.373988

Bucket Type/Size : Bucket Excavator Shear Vane Peak/Remolded (kPa) Excavatability (Relative Scale) Graphic Symbol Scala Penetrometer Depth (m BGL) Symbol Elevation (mRL) Moisture Cond. Consistency/ Density Index Water Level **DESCRIPTION** Blows per 100mm Material Harder uscs : Easier 6 8 10 12 SILT with some sand, trace gravel and മ F-St ML rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. Sandy fine to medium GRAVEL with some silt and trace rootlets; greyish brown with orange mottles. Well graded, subangular to subrounded. Sand, fine. D MD-D Sand becomes some from 0.4 m depth. 0.5 Sandy fine to coarse GRAVEL; greyish brown. Well graded, subangular to subrounded. Sand, fine to coarse. MD-D GW 1.5 Trace cobbles encountered from 1.6 m depth. Depth of Excavation: 2 m Termination Condition: Target depth

Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019;11:27 - TEST PIT LOGS;GPJ NZ MASTER DATA TEMPLATE.GDT 4/12/19

TS = TOPSOIL

Noticeable sand increase from 0.7 m depth.



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd: Shear Vane No: N/A
Date: 26/11/2019
Logged By: KF
t Depth: 2 m
Reviewed By: .IW

Longitude: 172.374642

Max Test Pit Depth: 2 mReviewed By: JWDigger Type/Size: 24 TonneLatitude: -43.628684

Ш							Buonot Typoroizo 15		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,								
	Depth (m BGL)	Material	Easier B)	cavatabi ative Sc	tale) Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo		netrom er 100r 8 10	
	_	TS				ML	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1				F-St			Î		
	- -					GW	Fine to medium GRAVEL with some sand and silt; brownish grey. Well graded, subangular to subrounded. Sand, fine to medium.	はお			D	MD-D					/^>
		ALLUVIUM				GW	Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subangular to subrounded. Sand, fine to coarse. Cobbles become minor from 1.1 m depth.				М	MD-D					
j	-						Termination Condition: Target depth										
٠l		I											1	:	: :		•

Bucket Type/Size : Bucket Excavator

Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019.11.27 - TEST PIT LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 4/12/19

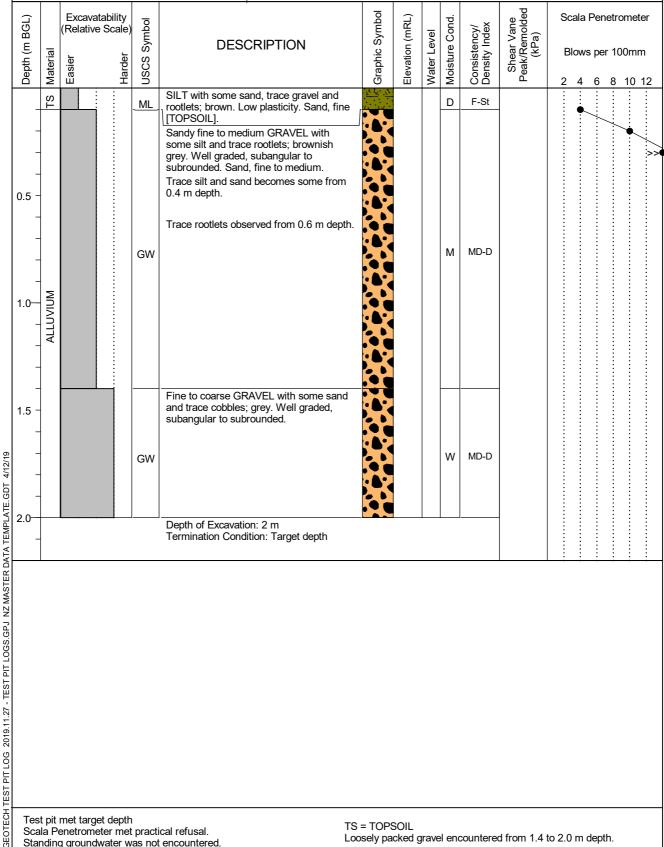


Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Logged By: KF Date : 26/11/2019

Max Test Pit Depth : 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: -43.628875 Longitude: 172.375619 Bucket Type/Size : Bucket Excavator



Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

TS = TOPSOIL

Loosely packed gravel encountered from 1.4 to 2.0 m depth.



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd:

Shear Vane No: N/A

Date: 26/11/2019

Logged By: KF

it Depth: 2 m

Reviewed By: JW

Max Test Pit Depth: 2 mReviewed By : JWDigger Type/Size: 24 TonneLatitude : -43.628098Bucket Type/Size: Bucket ExcavatorLongitude : 172.375881

						Bucket Type/Size . D	donot L	//ou vu	.01			Longitude		0700	JO 1		
Depth (m BGL)	Material	Easier ()	cavatability ative Scale bus ET	Syn	DES	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	ВІ	ala Pe	er 10	0mn	m
	TS	Ш	π	ML	SILT with some sa rootlets; brown. Lo [TOPSOIL].	and, trace gravel and ow plasticity. Sand, fine	17 · 34 · 19 · 1	Ш	5	D	F-St	п.	2	4 6	8	10	12
- 0.5					Sandy fine to med some silt and trac brown. Well grade subrounded. Sand	d, subangular to	DO CO								•		\ >>
-					Silt becomes trace	e from 0.6 m depth.	X										
_					Gravel becomes fi depth.	ne to coarse from 0.8 m	X										
1.0	ALLUVIUM			GW	Trace cobbles end depth.	countered from 1.0 m				M	MD-D						
1.5 - - -					Cobbles become r	ninor from 1.4 m depth.											
2.0-					Depth of Excavation Termination Cond	on: 2 m ition: Target depth	X										

Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019.11.27 - TEST PIT LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 4/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd:

Shear Vane No: N/A

Date: 26/11/2019

Logged By: KF

it Depth: 2 m

Reviewed By: JW

Max Test Pit Depth: 2 mReviewed By : JWDigger Type/Size: 24 TonneLatitude : -43.628312Bucket Type/Size: Bucket ExcavatorLongitude : 172.376954

		129	903		Bucket Type/Size				or			Longitude				,	
Depth (m BGL)	Material	cavatability ative Scale)	USCS Symbol	DESC	CRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo		oer í	100m	
_	TS		ML	SILT with some sa rootlets; brown. Lo [TOPSOIL].	and, trace gravel and ow plasticity. Sand, fi	ine	1/ · 2/ · 1/ 1/ · 2/ · 1/ 2/ · 1/ · 1/				F-St			1			
-			GW		RAVEL with some e rootlets; brownish , subangular to I, fine.		X			D	MD-D					\	>>
0.5	ALLUVIUM		GW	rootlets; grey. We subrounded. Sand Sand becomes so No rootlets observed. Trace cobbles end depth. Cobbles become recorded to the second sec	me from 0.8 m depth red from 0.9 m depth countered from 1.1 m	n. I.				М	MD-D						
_	-			Depth of Excavation Termination Cond	on: 2 m ition: Target depth												

Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019.11.27 - TEST PIT LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 4/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 26/11/2019 Logged By: KF Max Test Pit Depth : 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: -43.627512 Longitude: 172.377228 Bucket Type/Size : Bucket Excavator

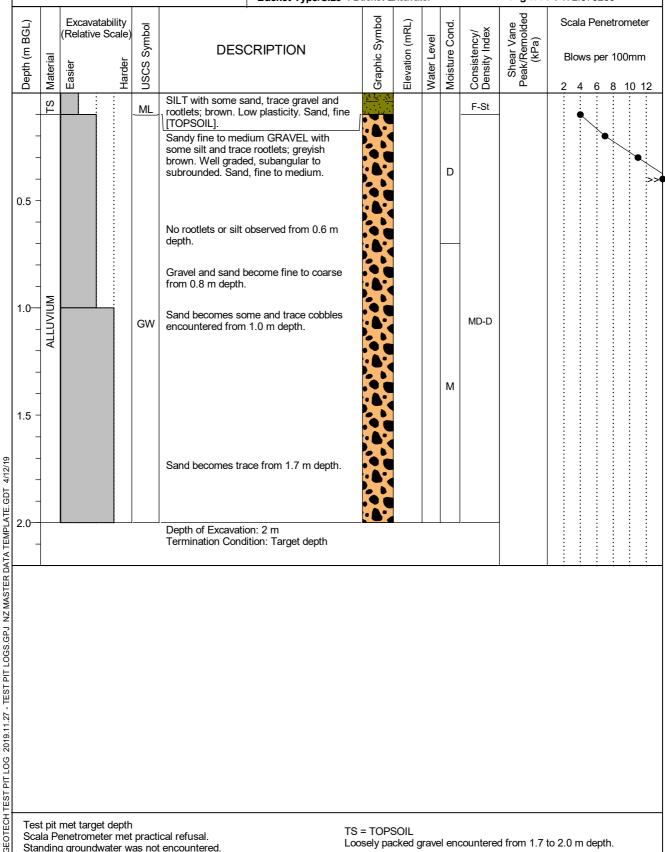
						Bucket Type/Size		Licava	LOI			Longitude	. 17	2.5	1 1 2 2	.0	
Depth (m BGL)	Material	Easier (Easier (Easier	avatak ative S	ility Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)			s per	100	meter Omm 10 12
	TS			:	ML	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine	74 1× 74				F-St			:	:		
-					GW	[TOPSOIL]. Fine to medium GRAVEL with some sand, silt and trace rootlets; brownish grey. Well graded, subangular to subrounded. Sand, fine.					MD-D			•	,	•	
0.5 -						Sandy fine to coarse GRAVEL with trace rootlets; grey. Well graded, subangular to subrounded. Sand, fine to coarse. Sand becomes trace from 0.6 to 0.7 m depth. Trace cobbles encountered from 0.8 m depth.				D							
1.0	ALLUVIUM				GW	асрат.					MD-D						
1.5 = - -										M							
_						Sand becomes trace from 1.8 m depth.											
2.0			·			Depth of Excavation: 2 m Termination Condition: Target depth											
Sca	ıla Pe	enetro	arget o	r met	pract	ical refusal. TS t encountered.	s = TOPS	SOIL									



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Logged By: KF Date : 26/11/2019 Max Test Pit Depth : 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: -43.627741 Longitude: 172.378285 Bucket Type/Size : Bucket Excavator



Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

TS = TOPSOIL

Loosely packed gravel encountered from 1.7 to 2.0 m depth.



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 26/11/2019 Logged By: KF Max Test Pit Depth : 1.8 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: -43.627003 **Longitude**: 172.378526 Bucket Type/Size : Bucket Excavator

						Bucket T	⊺ype/Size ∶Bu	ucket Ex	xcavat	or			Longitude	: 1/2	.378	526	
Depth (m BGL)	(F	Excav Relativ	vatabi ve Sc	Harder (alcil	USCS Symbol	DESCRIPTIO	N	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo		oer 10	ometer 00mm 10 12
0.5 -					ML	SILT with some sand, trace grootlets; brown. Low plasticity [TOPSOIL]. Fine to medium GRAVEL with sand, silt and trace rootlets; gbrown. Well graded, subangul subrounded. No silt encountered from 0.4 in the same same same same same same same sam	r. Sand, fine h some reyish lar to	されている。			D	S-F		•		\(\frac{1}{2}\)	•
1.0 NININININININININININININININININININI					GW	Sandy fine to coarse GRAVEI cobbles; grey. Well graded, su subrounded. Sand, fine to coarse GRAVEI cobbles; grey. Well graded, su subrounded.	L with trace ubangular to arse.				M	MD-D					
2.0-						Depth of Excavation: 1.8 m Termination Condition: Target	t depth										
Z.0— Test pit Scala F Standir																	
Test pit Scala F Standir	Per	etron	neter	met	pract	cal refusal. encountered.	TS:	= TOPS	6OIL								



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 26/11/2019 Logged By: KF Reviewed By: JW

Max Test Pit Depth : 1.9 m Digger Type/Size : 24 Tonne Latitude : -43.629026 **Longitude**: 172.37652 Bucket Type/Size : Bucket Excavator

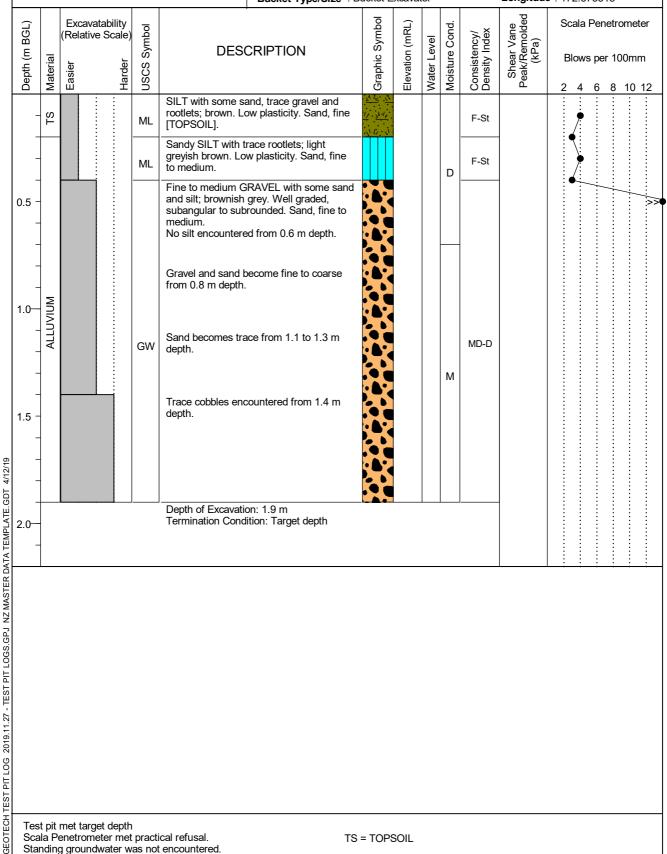
						Bucket Type/Siz	ze : Bu	cket Ex	kcavai	or			Longitude	: 1/2	2.376	052	
Depth (m BGL)	Material	Exca (Relat sier Easier	vatab ive S	Harder (əleb	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo	ows p	per 1	ometer 00mm
-	TS				ML	SILT with some sand, trace gravel an rootlets; brown. Low plasticity. Sand, [TOPSOIL].	d . fine /	1				F-St		:	•		
0.5 -					GW	Fine to medium GRAVEL with some sand, silt and trace rootlets; greyish brown. Well graded, subangular to subrounded. No silt encountered from 0.4 m depth	1.				D	MD-D					
- - 1.0—	/IUM					Sandy fine to coarse GRAVEL; grey. graded, subangular to subrounded. So fine to coarse. Trace cobbles encountered from 1.0	and,										
- - -	ALLUVIUM				GW	depth. Sand becomes some from 1.3 m depth.					М	MD-D					
1.5 - - - -																	
2.0-						Depth of Excavation: 1.9 m Termination Condition: Target depth	-										
Tes	t pit l	met ta	rget o	depth	proof	ical refusal.	TS =										



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Logged By: KF Date: 26/11/2019

Max Test Pit Depth: 1.9 m Reviewed By: JW Digger Type/Size : 24 Tonne Latitude: -43.62955 Bucket Type/Size : Bucket Excavator Longitude: 172.375318





Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 26/11/2019 Logged By: KF

Max Test Pit Depth : 1.9 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: -43.630024 Longitude: 172.377367 Bucket Type/Size : Bucket Excavator

							Bucket Type/Size : I	Bucket Ex	xcava	tor			Longitude	: 1/2.	3//36	7	
Depth (m BGL)	Material	Easier (Rela (Re) (Rela (Rela (Rela (Rela (Re) (Rela (Rela (Rela (Rela (Rela (Re) (Rela (Re) (Re) (Re) (Re) (Re) (Re) (Re) (Re)	avatak ative S	oility cale) Harder H	USCS Symbol	DES	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)		a Penovs per		mm
0.5 -	TS				ML	rootlets; brown. L [TOPSOIL]. Fine to coarse GF silt and trace root graded, subangul fine to medium. No silt encountered	and, trace gravel and ow plasticity. Sand, fine RAVEL with some sand, lets; greyish brown. Well ar to subrounded. Sand, ed from 0.5 m depth. countered from 0.6 m				D	F-St					
- 1.0 - -	ALLUVIUM				GW		ved from 1.0 m depth.					MD-D					
- 1.5 - - -						Copples become	minor from 1.3 m depth.				M						
- 2.0- -						Depth of Excavati Termination Cond	on: 1.9 m lition: Target depth				<u> </u>						
Sca	la Pe	enetr	arget o	r met	t pract	ical refusal. t encountered.	TS	s = TOPS	SOIL								



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd:
Shear Vane No: N/A

Date: 26/11/2019
Logged By: KF

Max Test Pit Depth: 2 m
Reviewed By: JW

Digger Type/Size: 24 Tonne

Bucket Type/Size: Bucket Excavator

Latitude: -43.629807

Longitude: 172.376332

					Bucket Type/Size . I	JUCKEL L		lOi			Longitude	. 172.370	JJZ	
Depth (m BGL)	Material	Easier (b)	cavatability lative Scale	Symbo	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Pe Blows p	er 100	
	TS			ML	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].					F-St		•		0 12
_				ML	Sandy SILT with trace gravel and rootlets; greyish brown. Low plasticity. Sand, fine.					St-H				>>
0.5 -				GW	Fine to medium GRAVEL with some sand and silt; brownish grey. Well graded, subangular to subrounded. Sand, fine to medium.	XXX			D	MD-D				
-					Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subangular to subrounded. Sand, fine to coarse.									
1.0	ALLUVIUM				Becomes moist from 1.0 m depth.									
_	A			GW	Sand becomes trace from 1.2 to 1.4 m depth.					MD-D				
1.5 -									М					
-					Sand becomes trace from 1.8 to 2.0 m depth.									
2.0					Depth of Excavation: 2 m Termination Condition: Target depth									

Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019.11.27 - TEST PIT LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 4/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client : Hughes Developments Ltd Shear Vane No : N/A
Date : 26/11/2019 Logged By : KF
Pit Depth : 2 m Reviewed By : JW

Max Test Pit Depth: 2 mReviewed By : JWDigger Type/Size: 24 TonneLatitude : -43.630517Bucket Type/Size: Bucket ExcavatorLongitude : 172.376123

							Bucket Type/Size : B	ucket E	xcava	or			Longitude	: 172.	3/61	23	
Depth (m BGL)	Material	Easier)	cavatabili lative Sca	Harder el Ati	USCS Symbol	DES	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blov	vs pe	netrometor er 100mn 8 10	n
	TS			_	ML		and, trace gravel and ow plasticity. Sand, fine		ш_	>	V	F-St		2 4		8 10	12
0.5					GW	Fine to medium C sand, silt and trac brown. Well grade subrounded. Sand No silt observed fi	ed, subangular to d, fine.	K K K			D	MD-D			•		X
1.0-	ALLUVIUM				GW	sand, silt and trace brown. Well grade subrounded. Sand Trace cobbles endepth. Cobbles become in	ed, subangular to d, fine. countered from 0.9 m minor from 1.4 m depth.				М	MD-D					
-	-					Depth of Excavation Termination Cond	on: 2 m lition: Target depth										

Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019.11.27 - TEST PIT LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 4/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client : Hughes Developments Ltd Shear Vane No : N/A
Date : 27/11/2019 Logged By : KF
Max Test Pit Depth : 2 m Reviewed By : JW

Digger Type/Size: 24 Tonne

Bucket Type/Size: Bucket Excavator

Latitude: -43.630801

Longitude: 172.377121

					Bucket Type/Size . L	Jucket L	.xcavai	O			Longitude	. 1/2		121	
Depth (m BGL)	Material	Easier (Rela	cavatability ative Scale) Depu	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo		er 100	l
0.5 -	N ST			ML GW	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. Fine to medium GRAVEL with some sand, silt and trace rootlets; greyish brown. Well graded, subangular to subrounded. Sand, fine to medium. No rootlets observed from 0.4 m depth.		Ш	>	D	St-VSt MD-D			4 0		 >>
1.0	ALLUVIUM			GW	Fine to coarse GRAVEL with some sand and trace rootlets; grey. Well graded, subangular to subrounded. Sand, fine to coarse. Trace cobbles encountered from 1.4 m depth.				М	MD-D					
_					Depth of Excavation: 2 m Termination Condition: Target depth										

Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019.11.27 - TEST PIT LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 4/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/11/2019 Logged By: KF

Max Test Pit Depth : 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne **Latitude**: -43.631612 Longitude: 172.376997 Bucket Type/Size : Bucket Excavator

						Bucket Type/Size : I	Sucket E	xcava	tor			Longitude	: 1/2.	3/69	197	
Depth (m BGL)	Material	Excavatab (Relative Solicity is is is is is is	y (elli cale) Harder	USCS Symbol	DES	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo		er 10	ometer 00mm 10 12
-	TS			ML	SILT with some s rootlets; brown. Le [TOPSOIL].	and, trace gravel and ow plasticity. Sand, fine	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1				F-St		•			
-				GW		GRAVEL with some be rootlets; greyish ed, subangular to d. fine to medium.	以			D	MD-D				-	
0.5 -					Fine to coarse GF trace cobbles and	RAVEL with some sand, I rootlets; grey. Well ar to subrounded. Sand,										
1.0	ALLUVIUM			GW	Cobbles become	minor from 1.4 m depth.				М	MD-D					
1.5 -					CODDICS DECOME	TILLION TO THE COPULE										
2.0					Depth of Excavati Termination Cond	on: 2 m dition: Target depth										
													•	- 1	-	-; ;
Scal	la Pe	met target o enetrometer g groundwa	r met	pract	ical refusal. t encountered.	TS	S = TOPS	OIL								



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/11/2019 Logged By: KF

Max Test Pit Depth : 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: -43.632226 **Longitude**: 172.377512 Bucket Type/Size : Bucket Excavator

						Bucket Type/Size	. Du	CKEL L	Nuavai	UI			Longitude	. I/2	2.311	312	
Depth (m BGL)	Material	Easier (Rela	avatabi ative Sc	Harder (alg	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)		ows p	oer 10	ometer 00mm 10 12
_	TS				ML	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fin [TOPSOIL].	e	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				St-VSt			•		
-					GW	Fine to medium GRAVEL with some sand, silt and trace rootlets; greyish brown. Well graded, subangular to subrounded. Sand, fine.						MD-D				•	\/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
0.5 -						Fine to coarse GRAVEL with some sand grey. Well graded, subangular to subrounded. Sand, fine to coarse. Trace cobbles encountered from 0.7 m depth.	d;	XXX			D						
1.5 -	ALLUVIUM				GW	Trace rootlets observed from 1.4 to 1.6 depth.	m					L-MD					
STER DATA TEMPLATE.GDT 4/12/19	-					Becomes brownish grey from 1.7 m depth.		X			M						
DATA TEMP						Depth of Excavation: 2 m Termination Condition: Target depth											
GEOTECH TEST PIT LOG 2019.11.27 - TEST PIT LOGS.GPJ NZ MASTER D G S A ES S A																	
Tes Sca Star	ala P	enetro	arget dometer	met	practi			: TOPS		ırave	el end	countere	d from 0.5	to 1.0	m de	pth.	



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/11/2019 Logged By: KF

Max Test Pit Depth : 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude : -43.632008 Longitude: 172.378017 Bucket Type/Size : Bucket Excavator

						Bucket Type/Oize		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					. 172.			
Depth (m BGL)	Material		avatabili tive Sca		USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)		vs per	tromete 100mm 8 10 1	า
_	TS				ML	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].				_	F-St		•			
_				•	GW	Fine to medium GRAVEL with some sand and silt; greyish brown. Well graded, subangular to subrounded. Sand, fine.	以				MD-D					/>
0.5 -				•	GW	Fine to coarse GRAVEL with some sand and trace cobbles; brownish grey. Well graded, subangular to subrounded. Sand, fine to coarse.	1000			D	MD-D					
1.0-	ALLUVIUM				GW	Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subangular to subrounded. Sand, fine to coarse.				M	MD-D					
STER DATA TEMPLATE.GDT 4/12/19 0 0 0 1 1	-					Becomes wet from 1.8 m depth. Cobbles become minor from 1.9 m depth.	X			w						
2.0—		<u> </u>				Depth of Excavation: 2 m Termination Condition: Target depth			1							
GEOTECH TEST PIT LOG 2019.11.27 - TEST PIT LOGS.GPJ NZ MASTER DAT. GS S A B S & A B B S & A B B S & A B B S & A B B B B B B B B B B B B B B B B B B																
Tes Sca Stal	la P	enetro	arget de ometer r undwate	net	practi as not	ical refusal. TS	= TOPS	SOIL								



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/11/2019 Logged By: KF Reviewed By: JW

Max Test Pit Depth : 2 m

Digger Type/Size : 24 Tonne **Latitude**: -43.631103 **Longitude**: 172.378188 Bucket Type/Size : Bucket Excavator

						Bucket Type/Size . I	DUCKEL L	льаvа	lOI			Longitude	. 1/2	57	3100		
Depth (m BGL)	Material	Excav (Relati			USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Ble	ows	per 1	romet 00mr 10	m
	TS				ML GW	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. Fine to medium GRAVEL with some sand, silt and trace rootlets; greyish brown. Well graded, subangular to subrounded. Sand, fine.					F-St			•	•		/.^
0.5	5				GW	Fine to coarse GRAVEL with some sand and trace cobbles; brownish grey. Well graded, subangular to subrounded. Sand, fine to coarse.				D	MD-D						
1.0-	ALLUVIUM					Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subangular to subrounded. Sand, fine to coarse.											
1.5					GW	Trace cobbles encountered from 1.4 m depth.	XXX			M	MD-D						
2.0-						Depth of Excavation: 2 m Termination Condition: Target depth											
To	at nit	mot to:	raot d	onth													
Sca	ala P	met tar enetror g grour	neter	met	pract	ical refusal. TS t encountered.	= TOPS	SOIL									



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/11/2019 Logged By: KF Reviewed By: JW

Max Test Pit Depth : 1.9 m Digger Type/Size : 24 Tonne Latitude : -43.628972 **Longitude**: 172.378419 Bucket Type/Size : Bucket Excavator

				'-	<i></i>		Bucket Type/Size :	Bucket E	xcava	tor			Longitude	: 17	'2.3	7841	9	
Depth (m BGL)	Material	Easier Relan)	avata tive	ability Scale	2) 4	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)			s per	100	meter Omm
0.5 -	ST				N	иL	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. Fine to medium GRAVEL with some sand, silt and trace rootlets; brownish grey. Well graded, subangular to subrounded. Sand, fine to coarse. Becomes moist from 0.6 m depth.		ш		D	St-VSt MD-D				•	0	•
1.0—	ALLUVIUM						Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subangular to subrounded. Sand, fine to coarse.				M	MD-D						
- 1.5 - - -					G	SW .	Gravel becomes fine to medium from 1.4 to 1.6 m depth. Depth of Excavation: 1.9 m					MU-D						
2.0-							Termination Condition: Target depth											
Sca	la Pe	met ta	met	er me	et pra	ractio	cal refusal. TS encountered.	S = TOP	SOIL									



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd: Shear Vane No: N/A
Date: 27/11/2019 Logged By: KF
Max Test Pit Depth: 2 m Reviewed By: JW

Digger Type/Size: 24 Tonne

Bucket Type/Size: Bucket Excavator

Latitude: -43.630257

Longitude: 172.378612

				Bucket Type/Olze : B									
Depth (m BGL)	Material	Easier (Selative Scale) Harder Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blows	Penetrome	m
0.5 -	ALLUVIUM TS M		ML	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. Fine to medium GRAVEL with some sand, silt and trace rootlets; greyish brown. Well graded, subangular to subrounded. Sand, fine to medium. Gravel and sand become fine to coarse from 0.6 m depth. No silt encountered from 0.7 m depth. Cobbles become minor from 1.5 m depth.			M	<u>D</u> <u>M</u>	St-VSt MD-D	d	2 4	6 8 10	>>•
2.0				Depth of Excavation: 2 m Termination Condition: Target depth	25								

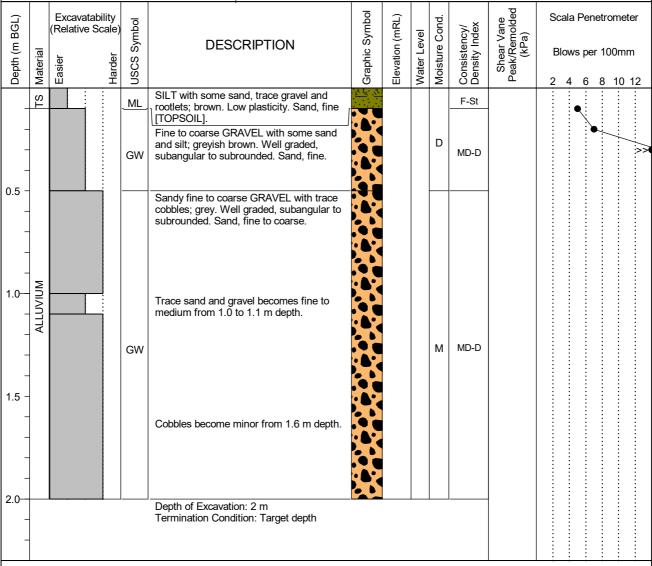
Test pit met target depth Scala Penetrometer met practical refusal. Standing groundwater was not encountered

GEOTECH TEST PIT LOG 2019.11.27 - TEST PIT LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 4/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Digger Type/Size: 24 TonneLatitude: -43.625244Bucket Type/Size: Bucket ExcavatorLongitude: 172.377003



Test pit met target depth. Scala Penetrometer met target depth Standing groundwater was not encountered.

GEOTECH TEST PIT LOG 2019.12.XX - REMAINING TP LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 9/12/19

TS = TOPSOIL

Partial sidewall collapse observed from 0.8 to 1.2 m depth.



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd:
Shear Vane No: N/A

Date: 05/12/2019
Logged By: KF/CR

Max Test Pit Depth: 2 m
Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude : -43.62571

Bucket Type/Size : Bucket Excavator Longitude : 172.37585

				Bucket Type/Size . I	Jucket L	.ncava	lOi			Longitude	, . 1/2	.575	55	
Depth (m BGL)	Material	Excavatabili (Relative Sca	Harder a A	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo	ws p	enetron per 100)mm
0.5 -	ALLUVIUM TS N		<u>ML</u>	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. Fine to coarse GRAVEL with some sand, silt and trace cobbles; greyish brown. Well graded, subangular to subrounded. Sand, fine.			\$	D	St-VSt MD-D	п.	2	4 6	8 1	10 12 >>
1.5 -			GW					M	MD-D					
-				Depth of Excavation: 2 m Termination Condition: Target depth										

Test pit met target depth. Scala Penetrometer met target depth Standing groundwater was not encountered.

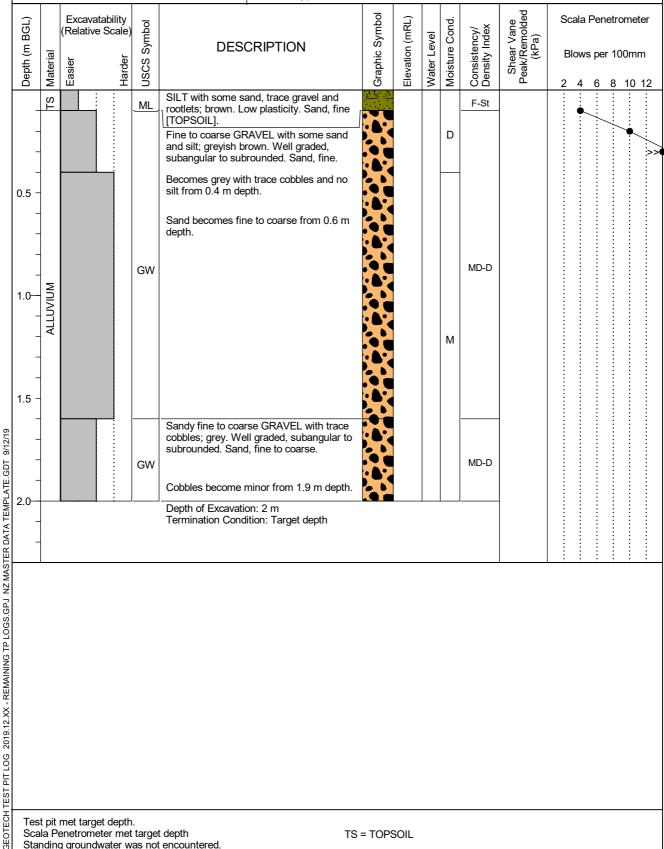
GEOTECH TEST PIT LOG 2019.12.XX - REMAINING TP LOGS.GPJ NZ MASTER DATA TEMPLATE. GDT 9/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 05/12/2019 Logged By: KF/CR Max Test Pit Depth : 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: -43.626261 Longitude: 172.374476 Bucket Type/Size : Bucket Excavator





Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client : Hughes Developments Ltd Shear Vane No : N/A

Date : 05/12/2019 Logged By : KF/CR

Max Test Pit Depth: 2 mReviewed By : JWDigger Type/Size: 24 TonneLatitude : -43.62611Bucket Type/Size: Bucket ExcavatorLongitude : 172.373398

						Bucket Type/Size . D	ucket L	λυαναι	UI			Longitude	. 1/2	.57 55	90	
Depth (m BGL)	Material	Easier B x	cavatability lative Scale de E E E E E E E E E E E	USCS Symbol	DESC	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo	ws pe	netron er 100	
	TS			ML	SILT with some sa rootlets; brown. Lo [TOPSOIL].	and, trace gravel and ow plasticity. Sand, fine		ш	1		St-VSt			1 0	<u> </u>	0 12
0.5	-			GW	silt; greyish brown	se GRAVEL with some . Well graded, rounded. Sand, fine.				D	MD-D			· ·		Ä
-				sw	Fine to coarse SA grey. Well graded.	ND with trace gravel;					MD-D					
1.0	ALLUVIUM			GW	cobbles; grey. We subrounded. Sand					М	MD-D					
2.0-				,	Depth of Excavation Termination Cond	on: 2 m ition: Target depth										
<u> </u>													:			

Test pit met target depth. Scala Penetrometer met target depth Standing groundwater was not encountered.

GEOTECH TEST PIT LOG 2019.12.XX - REMAINING TP LOGS.GPJ NZ MASTER DATA TEMPLATE. GDT 9/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd:

Date: 05/12/2019
Logged By: KF/CR
Depth: 2 m
Reviewed By: JW

Max Test Pit Depth: 2 mReviewed By : JWDigger Type/Size: 24 TonneLatitude : -43.625636Bucket Type/Size: Bucket ExcavatorLongitude : 172.37306

						Bucket Type/Size . D	JUCKEL L	.xcava	ıoı			Longitude	. 112	.07.00	,0	
Depth (m BGL)	Material	Excavata (Relative S	yarder Harder	USCS Symbol	DES	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo	ws pe	netroner 100	mm
-	ST			ML	rootlets; brown. Lo [TOPSOIL]. Fine to coarse GF	and, trace gravel and by plasticity. Sand, fine		ш.			F-St			•		0 12
0.5 -			····-	GW	graded, subangula fine.	ets; greyish brown. Well ar to subrounded. Sand,	K C			D	MD-D					>>
- - - 1.0-	ALLUVIUM			GW	Sandy fine to coal cobbles; grey. We subrounded. Sand	se GRAVEL with trace ill graded, subangular to d, fine to coarse.					MD-D					
1.5 -	ALL			GW	and trace cobbles	RAVEL with some sand grey. Well graded, rounded. Sand, fine to				М	MD-D					
-					Sand becomes tra	ace from 1.8 m depth.	X									
2.0-					Depth of Excavati Termination Cond	on: 2 m ition: Target depth										

Test pit met target depth. Scala Penetrometer met target depth Standing groundwater was not encountered.

GEOTECH TEST PIT LOG 2019.12.XX - REMAINING TP LOGS.GPJ NZ MASTER DATA TEMPLATE. GDT 9/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd:
Shear Vane No: N/A

Date: 05/12/2019
Logged By: KF/CR

Max Test Pit Depth: 2 m
Reviewed By: JW

Digger Type/Size: 24 Tonne Latitude: -43.625349

Bucket Type/Size: Bucket Excavator Longitude: 172.373725

				Bucket Type/Size . D	ucket L	ncava	LOI			Longitude	. 172	.5151	23	
Depth (m BGL)	Material	Excavatability (Relative Scale)	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo	ws p	netroner 100	mm
0.5 -	ALLUVIUM TS N		ML GW	SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. Fine to coarse GRAVEL with some sand, silt and trace rootlets; greyish brown. Well graded, subangular to subrounded. Sand, fine. Sandy fine to coarse GRAVEL with trace cobbles; grey. Well graded, subangular to subrounded. Sand, fine to coarse. Sand becomes trace from 0.9 to 1.2 m depth. Cobbles become minor from 1.4 m depth. No rootlets encountered from 1.6 m depth.			A	D	St-VSt MD-D		2	4 6	8 1 •	0 12
-				Depth of Excavation: 2 m Termination Condition: Target depth										

Test pit met target depth. Scala Penetrometer met target depth Standing groundwater was not encountered.

GEOTECH TEST PIT LOG 2019.12.XX - REMAINING TP LOGS.GPJ NZ MASTER DATA TEMPLATE. GDT 9/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd:
Shear Vane No: N/A

Date: 05/12/2019
Logged By: KF/CR

Max Test Pit Depth: 2 m
Reviewed By: JW

Digger Type/Size: 24 Tonne Latitude: -43.625512

Bucket Type/Size: Bucket Excavator Longitude: 172.374782

							Bucket Typ	pe/Size : B	ucket E	xcava	tor			Longituae	: 172	.3/4/	82		
Depth (m BGL)	Material	Easier (b) x	cavatab ative S	Harder (ale)	USCS Symbol	DES	CRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo		er 100	meter Omm 10 12	
	TS				ML	SILT with some s rootlets; brown. L [TOPSOIL].	and, trace grav ow plasticity. S	vel and Sand, fine	7. 3.1. 7. 3.1.				F-St			•			
0.5					GW	Fine to coarse GF and silt; greyish b subangular to sub coarse.	rown. Well gra	aded,	XXX			D	MD-D						•>•
1.0-	ALLUVIUM				GW	Sandy fine to coa cobbles; brownish subangular to subcoarse.	grey. Well gragorounded. Sand	aded, d, fine to				М	MD-D						
						Termination Cond	lition: Target d	epth											
2																			

Test pit met target depth. Scala Penetrometer met target depth Standing groundwater was not encountered.

GEOTECH TEST PIT LOG 2019.12.XX - REMAINING TP LOGS.GPJ NZ MASTER DATA TEMPLATE. GDT 9/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd:
Shear Vane No: N/A

Date: 05/12/2019
Logged By: KF/CR

Max Test Pit Depth: 2 m
Reviewed By: JW

Digger Type/Size: 24 TonneLatitude: -43.62479Bucket Type/Size: Bucket ExcavatorLongitude: 172.375034

					Bucket Type/Size . L	JUCKET L	.ncava	.OI			Longitude	. 112	.07 00	JUT	
Depth (m BGL)	Material	Excavatabi (Relative So is is is is	Harder (ale	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo		enetron er 100	
-	Z L			ML	SILT with some sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine. Gravel becomes minor from 0.3 m depth.	<u>x </u>				F-St St-VSt			•		
0.5				GW	Fine to coarse GRAVEL with some sand, silt and trace rootlets; brownish grey. Well graded, subangular to subrounded. Sand, fine to coarse.				D	MD-D					>>1
1.0-	ALLUVIUM				Sandy fine to coarse GRAVEL with trace cobbles and rootlets; grey. Well graded, subangular to subrounded. Sand, fine to coarse.										
1.5	-			GW	Cobbles become minor from 1.6 m depth.				M	MD-D					
2.0					Depth of Excavation: 2 m Termination Condition: Target depth										

Test pit met target depth. Scala Penetrometer met target depth Standing groundwater was not encountered.

GEOTECH TEST PIT LOG 2019.12.XX - REMAINING TP LOGS.GPJ NZ MASTER DATA TEMPLATE. GDT 9/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A **Date**: 05/12/2019 Logged By : KF/CR

Max Test Pit Depth : 2 m Reviewed By: JW Digger Type/Size : 24 Tonne Latitude : -43.624988 **Longitude**: 172.376043

						Bucket Type/Size . L	JUCKEL L	Acava	LOI				. 172.5700	
Depth (m BGL)	Material	Easier (Sustantial)	cavatab ative S	y (ello Harder Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blows pe	netrometer er 100mm 8 10 12
-	ST				ML	SILT with some sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].	17 · 21 · 17 · 21				F-St		•	
0.5 -					GW	Fine to coarse GRAVEL with some sand; grey. Well graded, subangular to subrounded. Sand, fine to coarse.				D				*
- -						Sandy fine to coarse GRAVEL with trace cobbles; brownish grey. Well graded, subangular to subrounded. Sand, fine to coarse.	No.							
1.0-	ALLUVIUM				0144	Becomes moist from 1.0 m depth.					MD-D			
1.5					GW					M				
NZ MASTER DATA TEMPLATE.GDT 9/12/19 'C 'C 'I 'I 'I 'I 'I 'I 'I 'I						Depth of Excavation: 2 m								
TER DATA TE						Termination Condition: Target depth								
2019.12.XX - REMAINING TP LOGS.GPJ														
등 Sca	ıla P	enetr	arget of cometer undwa	r met	targe	t depth TS t encountered.	= TOPS	SOIL						

Bucket Type/Size : Bucket Excavator



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 05/12/2019 $\textbf{Logged By} : \mathsf{KF}/\mathsf{CR}$ Max Test Pit Depth: 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude : -43.624293 Longitude: 172.376247 Bucket Type/Size : Bucket Excavator

						Bucket Type/Size .	DUCKEL L	.nuava	lOi			Longitude	. 17	2.51	024	<i>'</i>	
Depth (m BGL)	Material	Easier (les)	avatal ative S	bility Scale) Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)		ala l lows 4	per	100	neter Imm
-	TS		:		ML	SILT with some sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].	17 · ½· ½				F-St		:	1) :		
-				.	GW	Fine to coarse GRAVEL with some sand, silt and trace rootlets; greyish brown. Wel graded, subangular to subrounded. Sand, if fine.				D	MD-D			•	<i></i>		/×
NZ MASTER DATA TEMPLATE.GDT 9/12/19	ALLUVIUM				GW	Sandy fine to coarse GRAVEL with trace cobbles and rootlets; grey. Well graded, subangular to subrounded. Sand, fine to coarse. Sand becomes trace from 0.7 m depth. Cobbles become minor from 1.4 m depth. No rootlets encountered from 1.6 m depth.				М	MD-D						
R DATA TEMPL						Depth of Excavation: 2 m Termination Condition: Target depth				,,							
GEOTECH TEST PIT LOG 2019.12.XX - REMAINING TP LOGS.GPJ NZ MASTEF 監 公 会 会 会 会 会 会 会 会 会 会 会 会 会 会 会 会 会 会																	
Tes Sca Sta	ala P	enetr		r met	t targe	t depth Pa	S = TOPS artial side oticeable	wall c	ollap decr	se ol	bserved from 0.	from 0.4 m 7 m depth.	dept	h.			



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903 Client: Hughes Developments Ltd: Shear Vane No: N/A
Date: 05/12/2019
Logged By: KF/CR
it Depth: 2 m
Reviewed By: JW

Max Test Pit Depth: 2 mReviewed By : JWDigger Type/Size: 24 TonneLatitude : -43.628731Bucket Type/Size: Bucket ExcavatorLongitude : 172.377389

				Bucket Type/OIZC : B		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,							
Depth (m BGL)	Material	Excavatability (Relative Scale) auder H	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)		Penetro s per 100 6 8	
_	TS		ML	SILT with some sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].	17 · 37·14				F-St		•		
0.5 -			GW	Fine to coarse GRAVEL with some sand; grey. Well graded, subangular to subrounded. Sand, fine to coarse.	はは			D	MD-D				***
1.0	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with trace cobbles; brownish grey. Well graded, subangular to subrounded. Sand, fine to coarse. Sand becomes trace from 1.6 to 1.8 m				М	MD-D				
2.0-				Depth of Excavation: 2 m Termination Condition: Target depth									

Test pit met target depth. Scala Penetrometer met target depth Standing groundwater was not encountered.

GEOTECH TEST PIT LOG 2019.12.XX - REMAINING TP LOGS.GPJ NZ MASTER DATA TEMPLATE. GDT 9/12/19



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A **Date**: 05/12/2019 Logged By: KF/CR Max Test Pit Depth : 2 m Reviewed By: JW

Digger Type/Size : 24 Tonne Latitude: -43.628451 Longitude: 172.378087 Bucket Type/Size : Bucket Excavator

					Bucket Type/Size : Bucket Excavator					Longitude : 1/2.3/808/							
Depth (m BGL)	Material	Exca (Relati	vatab ive S	y tilic Harder Harder	USCS Symbol	DESC	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo	ows p	oer 1	ometer 00mm 10 12
-	TOPSOIL				ML	SILT with some sa brown. Low plastic [TOPSOIL].	and and trace rootlets; city. Sand, fine	\(\frac{1}{2} \frac{1}{2} \cdot \frac{1}{2} \cdo				F-St			•	•	
0.5 -					GW	Fine to coarse GF grey. Well graded subrounded. Sand	RAVEL with some sand; , subangular to d, fine to coarse.				D	MD-D					>
1.0	ALLUVIUM				GW	Sandy fine to coar cobbles; grey. We subrounded. Sand	rse GRAVEL with trace ell graded, subangular to d, fine to coarse.				M	MD-D					
2.0-						Depth of Excavation	on: 2 m										
- i -						Termination Cond	ition: Target depth										
Tes Sca Sta																	
Sca	ila P	met tar enetror g grour	nete	r met	targe	t depth t encountered.											



Geotechnical Investigation 92 Dunns Crossing Road Rolleston 12903

Client: Hughes Developments Ltd Shear Vane No: N/A **Date**: 05/12/2019 Logged By: KF/CR Max Test Pit Depth : 2.1 m Reviewed By: JW

Digger Type/Size : 24 Tonne **Latitude**: -43.62816 **Longitude**: 172.378736 Bucket Type/Size : Bucket Excavator

					Bucket Type/Size	Bucket E	xcava	itor				9:1/2.3/8/36
Depth (m BGL)	Material	Excavatal (Relative S	tility Scale) Harder Harder) yu	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm 2 4 6 8 10 12
- ¢	TS			ML	SILT with some sand and trace rootlets; brown. Low plasticity. Sand, fine [TOPSOIL].	17 · 77 · 17 · 17				F-St		f
0.5 -				GW	Fine to coarse GRAVEL with some sand, silt and trace rootlets; greyish brown. We graded, subangular to subrounded. Sand, fine.				D	MD-D		***
1.0	ALLUVIUM				Sandy fine to coarse GRAVEL with trace cobbles and rootlets; grey. Well graded, subangular to subrounded. Sand, fine to coarse. Sand becomes trace from 1.0 to 1.1 m depth.							
MAS LEK DATA LEMPLATE. GD1 9/12/19				GW	Sand becomes trace from 1.5 to 1.7 m depth. Cobbles become minor from 1.8 m depth				M	MD-D		
2.0												
류 로 -					Depth of Excavation: 2.1 m Termination Condition: Target depth							
GEOLECH IEST P11 LOG 2019/12/XX - REMAINING IP LOGS/GPJ NZ MAS LOGS/GPJ NZ MAS A LOGS/GPJ NZ MAS A LOG												
Test p Scala Stanc	a Pe	met target enetromete ggroundwa	er met	t targe	t depth T cencountered. P	S = TOPS artial side	SOIL wall c	ollap	se ol	bserved	from 0.8 m	depth.



APPENDIX 3:

ECan Borelogs



Bore or Well No	BX23/0895
Well Name	Selwyn Road
Owner	Mike & Tania Croucher



Well Number	BX23/0895	File Number	
Owner	Mike & Tania Croucher	Well Status	Active (exist, present)
Street/Road	Selwyn Road	NZTM Grid Reference	BX23:49887-68726
Locality	Springston	NZTM X and Y	1549887 - 5168726
Location Description		Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Domestic and Stockwater,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	53.50m	Water Level Count	1
Diameter	150mm	Initial Water Level	5.80m below MP
Measuring Point Description	Top of Casing	Highest Water Level	5.80m below MP
Measuring Point Elevation		Lowest Water Level	5.80m below MP
Elevation Accuracy		First reading	06 May 2019
Ground Level	0.45m below MP	Last reading	06 May 2019
Strata Layers	9	Calc Min 95%	
Aquifer Name		Aquifer Tests	0
Aquifer Type		Yield Drawdown Tests	1
Drill Date	16 Apr 2019	Max Tested Yield	
Driller	Clemence Drilling Contractors	Drawdown at Max Tested Yield	
Drilling Method	Rotary/Percussion	Specific Capacity	0.56 l/s/m
Casing Material	Steel	Last Updated	01 Oct 2019
Pump Type		Last Field Check	06 May 2019
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	51.5	53.5				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
06 May 2019	1	2.5	32.99546	4.5	15

Borelog for well BX23/0895

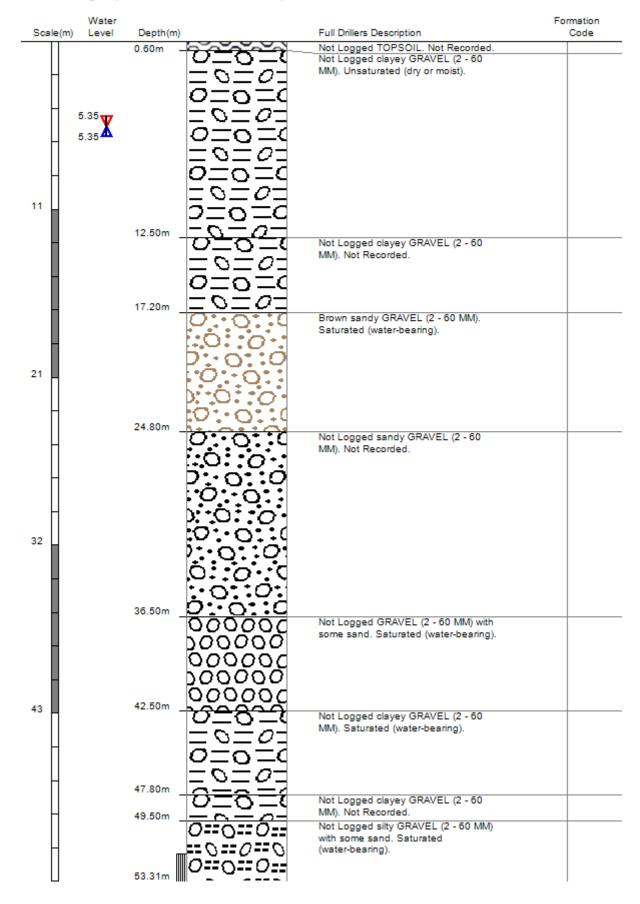
Grid Reference (NZTM): 1549888 mE, 5168727 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: m +MSD Accuracy: Driller: Clemence Drilling Contractors Drill Method: Rotary/Percussion

Borelog Depth: 53.3 m Drill Date: 16-Apr-2019





Bore or Well No	M36/4387
Well Name	DUNNS CROSSING RD
Owner	Mr & Mrs I G & D C Robertson



Well Number	M36/4387	File Number	CO6C/02792
Owner	Mr & Mrs I G & D C Robertson	Well Status	Active (exist, present)
Street/Road	DUNNS CROSSING RD	NZTM Grid Reference	BX23:49703-68988
Locality	ROLLESTON	NZTM X and Y	1549703 - 5168988
Location Description		Location Accuracy	2 - 15m
CWMS Zone	Selwyn - Waihora	Use	Domestic Supply,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	35.60m	Water Level Count	0
Diameter	200mm	Initial Water Level	5.65m below MP
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	36.46m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	5	Calc Min 95%	6.50m below MP
Aquifer Name		Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	2
Drill Date	11 Oct 1991	Max Tested Yield	18 l/s
Driller	McMillan Drilling Ltd	Drawdown at Max Tested Yield	10 m
Drilling Method	Rotary/Percussion	Specific Capacity	1.64 l/s/m
Casing Material	STEEL	Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	Yes		

Borelog for well M36/4387

Grid Reference (NZTM): 1549704 mE, 5168988 mN

Location Accuracy: 2 - 15m

Ground Level Altitude: 36.5 m +MSD Accuracy: < 2.5 m

Driller: McMillan Drilling Ltd Drill Method: Rotary/Percussion

Borelog Depth: 35.6 m Drill Date: 11-Oct-1991



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
Ш		0.30m -	000000	Earth Large Grey gravels	
			000000		
П		2.50m	000000	Sandy gravels	
Н			0.0.0.	Sandy gravers	
Н					
5					
- 4		6.50m _): 0: 0: d		
Ш		0.50111	000000	Claybound gravels	
Ш			00000		
			000000		
10			200000		
. П			<u>000000</u>		
Н			000000		
Н			000000		
Н			000000		
Н			000000		
15			000000		
- 4					
Ш			<u> </u>		
			000000		
			000000		
20			000000		
20		20.70m _	20200		
Н		_	0::0::0::	Free sandy gravels	
Н			1:0::0::0		
Н			p::0::0::q		
Н					
25); :O: :O: :O		
)::0::d		
			0::0::0::		
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30); O: :O: :Q		
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Н					
Ц		Ш	[:o::o::		
			b∷o∷o::a		
35			0:0::0::		
		35.59m			

Bore or Well No	M36/4449
Well Name	DUNNS CROSSING RD
Owner	TYACK GJ & FR



Well Number	M36/4449	File Number	CO6C/02046
Owner	TYACK GJ & FR	Well Status	Not Used
Street/Road	DUNNS CROSSING RD	NZTM Grid Reference	BX23:49508-69470
Locality	ROLLESTON	NZTM X and Y	1549508 - 5169470
Location Description	LOT 1	Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Irrigation,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	24.20m	Water Level Count	0
Diameter	150mm	Initial Water Level	
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	38.81m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	9	Calc Min 95%	7.70m below MP
Aquifer Name	Riccarton Gravel	Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	09 Jun 1992	Max Tested Yield	6 l/s
Driller	Dynes Road Drilling	Drawdown at Max Tested Yield	5 m
Drilling Method	Cable Tool	Specific Capacity	1.36 l/s/m
Casing Material		Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Borelog for well M36/4449

Grid Reference (NZTM): 1549508 mE, 5169471 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 38.8 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 24.2 m Drill Date: 09-Jun-1992



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
5		8.00m	00000000 00000000 00000000 00000000 0000	Medium-small gravel	
10		10.00m	00000000 00000000 00000000 00000000 0000	Medium-small gravel, very open	
		12.00m	000000000 00000000 00000000 000000000 0000	Medium-small gravel	
		14.00m _	000000 000000	Claybound small-medium gravel	
15				Small to large sandy gravel	
20		18.00m _	00000000 00000000 00000000 00000000 0000	Medium gravel, Water-bearing	
		22.00m	00000000 00000000 00000000 00000000 0000	Small-medium gravel,clean,open	
		24.00m	000000000 000000000 000000000 00000000	Small to medium gravel,stained	

Bore or Well No	M36/4450
Well Name	DUNNS CROSSING RD
Owner	Mr & Mrs L K & J C Blackmore



Well Number	M36/4450	File Number	CO6C/02046
Owner	Mr & Mrs L K & J C Blackmore	Well Status	Active (exist, present)
Street/Road	DUNNS CROSSING RD	NZTM Grid Reference	BX23:49388-69660
Locality	ROLLESTON	NZTM X and Y	1549388 - 5169660
Location Description	DP61278 LOT 2	Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Irrigation,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	25.20m	Water Level Count	0
Diameter	150mm	Initial Water Level	
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	39.62m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	8	Calc Min 95%	8.10m below MP
Aquifer Name	Riccarton Gravel	Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	09 Apr 1992	Max Tested Yield	6 l/s
Driller	Dynes Road Drilling	Drawdown at Max Tested Yield	6 m
Drilling Method	Cable Tool	Specific Capacity	1.00 l/s/m
Casing Material		Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	23.2	25.2				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
09 Apr 1992	1	6.1	80.50892	6.1	0

No comments for this well

Borelog for well M36/4450

Grid Reference (NZTM): 1549388 mE, 5169661 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 39.6 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 26.5 m Drill Date: 09-Apr-1992



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
5			00000000 00000000 00000000 00000000 0000	Medium to small gravel	
		8.00m _	0000000	Small to medium gravel, clay	
10		12.00m	000000 000000 000000		
15		12.00111	000000 000000 000000 000000	Clay, small to medium gravel	
20		18.00m _		Pea gravel and sand	
20		22.00m _	0.0.0.0.0 0.0.0.0 0.0.0.0 0.0.0.0	Pea gravel, sand, water	
25		24.00m	000000000	Tight clay and sand Medium to small gravel, open water	
\parallel		26.00m _ 26.50m	000000000	Tight clay and sand	

Bore or Well No	M36/7416
Well Name	SELWYN ROAD
Owner	Kilsyth Limited



Well Number	M36/7416	File Number	CO6C/20361
Owner	Kilsyth Limited	Well Status	Active (exist, present)
Street/Road	SELWYN ROAD	NZTM Grid Reference	BX23:49058-68781
Locality	ROLLESTON	NZTM X and Y	1549058 - 5168781
Location Description		Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Irrigation,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	46.90m	Water Level Count	0
Diameter	200mm	Initial Water Level	5.50m below MP
Measuring Point Description	ToC	Highest Water Level	
Measuring Point Elevation	35.86m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 5 m	First reading	
Ground Level	0.32m below MP	Last reading	
Strata Layers	13	Calc Min 95%	11.10m below MP
Aquifer Name		Aquifer Tests	0
Aquifer Type		Yield Drawdown Tests	1
Drill Date	18 Aug 2003	Max Tested Yield	
Driller	McMillan Drilling Ltd	Drawdown at Max Tested Yield	
Drilling Method	Rotary/Percussion	Specific Capacity	3.83 l/s/m
Casing Material	STEEL	Last Updated	08 Nov 2013
Pump Type		Last Field Check	
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	44.9	46.9				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
18 Aug 2003	1	15.91128	209.999985	4.15	3

Borelog for well M36/7416 page 1 of 2

Grid Reference (NZTM): 1549058 mE, 5168781 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 35.5 m +MSD Accuracy: < 0.5 m

Driller: McMillan Drilling Ltd Drill Method: Rotary/Percussion

Borelog Depth: 47.7 m Drill Date: 18-Aug-2003



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
		0.30m _		Earth and gravels	
		0.30m	0::0::0::	Earth and gravels	
Н			0.000	Sandy gravels	
- 11			$P_{1}^{*}O_{1}^{*}O_{2}^{*}O_{1}^{*}$		
Н			1:0::0::0:		
Ш			P. OO Q		
- 11			10:-0::0::		
)od		
Н					
5			1:0::0::01		
Ĭ			000		
- 1		5.60m	5.0.0.		
Ш		5.60m	000.1	Sandy gravels	
- 1				Wet claybound sandy gravels	
- 1			00		
H			0.0.0		
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1.1				water-bearing sandy gravels	
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П					

Bore or Well No	M36/20535
Well Name	870 Goulds Road
Owner	Mr S & Mrs M Baxter



Well Number	M36/20535	File Number	CO6C/31914
Owner	Mr S & Mrs M Baxter	Well Status	Active (exist, present)
Street/Road	870 Goulds Road	NZTM Grid Reference	BX23:50017-69231
Locality	Rolleston	NZTM X and Y	1550017 - 5169231
Location Description		Location Accuracy	10 - 50m
CWMS Zone	Selwyn - Waihora	Use	Domestic and Stockwater,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	30.00m	Water Level Count	0
Diameter	150mm	Initial Water Level	7.10m below MP
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	35.00m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	4	Calc Min 95%	
Aquifer Name		Aquifer Tests	0
Aquifer Type		Yield Drawdown Tests	0
Drill Date	04 Feb 2011	Max Tested Yield	
Driller	Daly Water Wells Ltd	Drawdown at Max Tested Yield	
Drilling Method	Rotary Rig	Specific Capacity	
Casing Material	STEEL	Last Updated	07 Dec 2011
Pump Type		Last Field Check	
Water Use Data	No		

No screen data for this well

No step tests for this well

Borelog for well M36/20535

Grid Reference (NZTM): 1550018 mE, 5169231 mN

Location Accuracy: 10 - 50m

Ground Level Altitude: 35.0 m +MSD Accuracy: < 0.5 m

Driller: Daly Water Wells Ltd Drill Method: Rotary Rig

Borelog Depth: 30.0 m Drill Date: 04-Feb-2011



Scale(m)	Water Level	Depth(m)	Full Drill	lers Description	Formation Code
		0.30m -	501		
Ц		0.30m	000000 501	slaybound gravel	
				saybound graver	
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			ooooog		
			200000		
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		30.00m			I



Submitted to:

Hughes Developments Ltd
Christchurch

ENGEO Limited

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Appendix 1: Site Plan and Inferred Paleo Channels

Appendix 2: ENGEO Hand Auger and Test Pit Logs

Appendix 3: ECan Borelogs

ENGEO Document Control:

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1 Introduction

ENGEO Ltd was requested by Hughes Developments Ltd to undertake a geotechnical investigation of the property at 597 East Maddisons Road, Rolleston, Christchurch, as outlined in our variation proposal (ref: P2020.001.804_01).

The purpose of this assessment is to develop a conceptual geological model of the site, assess the likely future land performance, comment on the suitability of the site for residential subdivision, address the requirements of Section 106 of the Resource Management Act (RMA), and provide recommendations for subdivision works and foundations for typical timber framed residential dwellings.

Our scope of works includes the following:

- Complete a desktop study of relevant available geotechnical and geological publications, including the NZ Geotechnical and Environment Canterbury Databases.
- Undertake a geotechnical site walkover.
- Undertake 29 hand auger boreholes with associated Scala penetrometer tests to assess the near surface material types and strength characteristics.
- Organise and observe the excavation of 26 test pits, including geotechnical logging of the exposed soils.
- Preparation of this report outlining our findings on the ground conditions and comment on the suitability of the site for residential subdivision, including the provision of the likely foundation Technical Category, conceptual foundation recommendations for typical timber framed residential dwellings, and discuss likely geohazards as required by Section 106 of the RMA.

2 Site Description

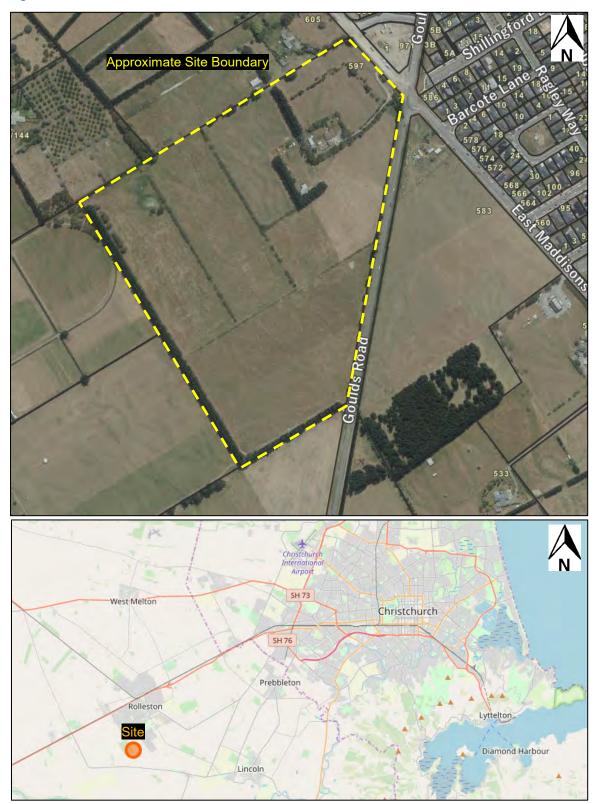
The site comprises of one property with a total area of four hectares and the following legal description (Canterbury Maps):

LOT 1 DP 57004 BLK III

The site is located approximately 3 km south of Rolleston town centre and is bound on all sides by rural properties (Figure 1).



Figure 1: Site Location Plan



 $Images\ sourced\ from\ Canterbury\ Maps\ and\ ``©\ OpenStreetMap\ contributors".\ Not\ to\ scale.$



3 Geological Model

3.1 Regional Geology

The site has been regionally mapped by GNS (Forsyth et al., 2008) as being underlain by brownish grey river alluvium (Q2a).

3.2 Geomorphology

The site comprises relatively flat ground, with gentle undulations and depressions in some areas. As evident on aerial imagery (Canterbury Maps, 2019) and observed during our site walkover conducted on 25 August 2020, undulating and depressed ground can be attributed to paleo-channels, which traverse the site in a general northwest to southeast direction (Figure 2). Based on observations, sandy silt deposits with variable thickness are expected to have in-filled the paleo-channels where they have not remained as channel features. Inferred paleo-channels have been mapped to give an indication of areas with potential channel in-fill (Appendix 1).

Figure 2: Historical Aerial Photo - 1970 - 1974

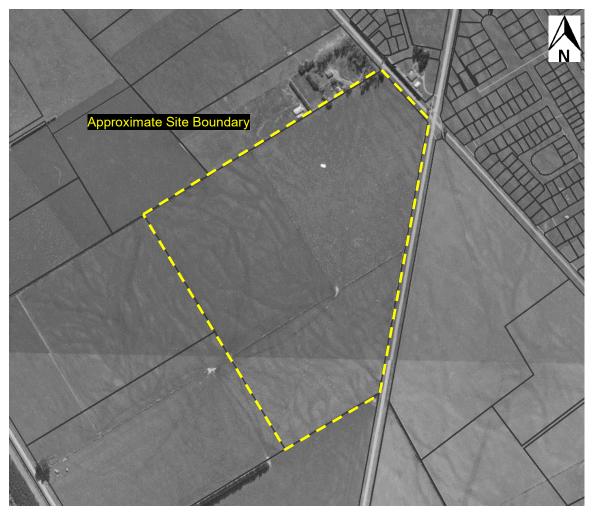


Image sourced from Canterbury Maps. Not to scale.



3.3 Geohazards

3.3.1 Seismicity

There are no known or mapped faults in the immediate area of the site, however the site may be at risk of ground shaking induced by movement of proximal or distal faults.

The site is located between two recently discovered fault systems, the Greendale Fault and the Port Hills Fault, the ruptures of which initiated the ongoing Canterbury Earthquake Sequence (CES). The Greendale Fault has been mapped approximately 6 km north / northwest of the site and trends roughly east-west with a surface rupture length of approximately 28 km (GNS, 2015), while the Port Hills Fault remains unmapped as the fault did not rupture at the surface. Movement on the Port Hills Fault is believed to have extended to within 1 km to 2 km below ground surface.

Large regional areas of faulting (GNS, 2015) namely the Ashley Fault, Porters Pass - Amberley Fault Zone, and the Hope and Alpine Faults, are further afield but present a high seismic hazard to the Christchurch area due to the anticipated size of earthquakes generated. The largest of these faults is the Alpine Fault, which has a return period of 250 - 300 years and is expected to produce a M8 earthquake. The last rupture on the Alpine Fault is believed to have occurred in 1717 (Pettinga et al., 2001).

3.3.2 Liquefaction and Lateral Spreading

The site is located in an area mapped where "damaging liquefaction is unlikely" (NZGD Map CGD5140, 2012), and a "zone of very low liquefaction potential" (GNS, 2006).

3.4 Site Investigation

Site investigations to assess the shallow subsurface material types and strength characteristics were undertaken by ENGEO on 27 and 28 August 2020. Twenty-six test pits and 29 hand auger investigations with associated Scala penetrometer tests were completed to a maximum depth of 2.2 m below ground level.

The investigations revealed subsurface conditions across the site are consistent with the published geological mapping, as summarised in Table 1. Hand auger and test pit logs are attached as Appendix 2.

Table 1: Summary of Subsurface Investigations

Soil Type	Depth to Top of Layer (m)	General Layer Thickness (m)	Density / Consistency	Additional Comments
TOPSOIL	0.0	0.1 – 0.3	Stiff to Very Stiff	-
Sandy GRAVEL	0.3	Unknown	Medium Dense to Very Dense	Tightly packed and consistent across the site



3.5 ECan Boreholes

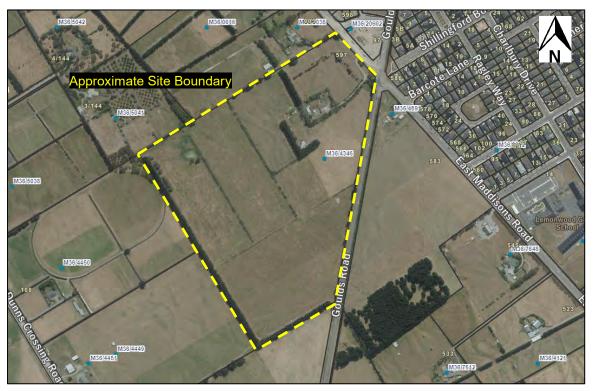
A review of five, deep ECan borehole logs was conducted. The first (M36/4346), is located on-site, and appear to be water wells providing the properties irrigation and domestic supply. The other boreholes are located to the east (M36/4891), north (M36/5041), south (M36/4449) and west (M36/7512) of the site.

Well logs from the five holes of interest are attached as Appendix 3 and summarised in Table 2.

Table 2: Generalised Summary of ECan Boreholes

ECan Borehole	Total Depth (m)	Water Level Below Ground Level (m)	Generalised Borelog as Logged by Driller
M36/4346	28.5	9.71	Gravel with silt and sand to 28.5 m depth. A layer of silt recorded from 6 to 8 m depth.
M36/4891	26.7	9.81	Gravel to 26.7 m depth.
M36/5041	34	9.73	Gravel with silt and sand to 34 m depth.
M36/4449	24.2	9.27	Gravel to 24.2 m depth.
M36/7512	29	9.32	Sandy gravel to 21.3 m depth.

Figure 3: Nearby ECan Borehole Locations



Aerial photograph sourced from Canterbury Maps. Not to scale.



3.6 Groundwater

Groundwater is recorded in the surrounding ECan boreholes at approximately 9 to 10 m depth.

3.7 Site Seismic Class

In accordance with NZS 1170.5:2004, Class D applies to this particular site, defining it as a 'deep soft soil site'.

4 Liquefaction Analysis

Owing to the nature of the subsurface materials and depth to groundwater at the site, we consider the potential for liquefaction and lateral spreading on the site to be very low.

We therefore consider future land performance to be in line with Technical Category 1 (TC1), whereby future land damage from liquefaction is unlikely, and ground settlements are expected to be within normally accepted tolerances.

5 RMA Section 106 Requirements and Suitability to Subdivide

Section 106 of the Resource Management Act 1991 states a consent authority may refuse to grant a subdivision consent, or may grant a consent subject to specific consent conditions if it considers that:

- There is a significant risk from natural hazards; or
- Sufficient provision has not been made for legal or physical access to each allotment to be created by the subdivision.

An assessment of the risk from natural hazards as required by the RMA includes the following:

- The likelihood of natural hazards occurring (whether individually or in combination);
- The material damage to land in respect of which the consent is sought, other land, or structures that would result from natural hazards; and
- Any likely subsequent use of the land in respect of which the consent is sought that would accelerate, worsen, or result in material damage of the kind referred to in paragraph (b).

We have assessed the risk of natural hazards at the site in accordance with Section 106 of the Resource Management Act (RMA) and considered the risk to the site from rockfall, inundation (debris), slope stability, subsidence, flooding and tsunami. Based on our observations and the nature of the site, its performance during the CES, and the site's distance from the nearest significant watercourse, we consider it is unlikely for the site to be subject to natural hazards such as rockfall, inundation (debris), slope stability, subsidence, flooding and tsunami. As such, the site is considered suitable for subdivision from a geotechnical perspective.



6 Geotechnical Recommendations

6.1 Earthworks

Earthworks carried out for the subdivision shall be in accordance with NZS 4404:2010, Land Development and Subdivision Infrastructure and NZS 4431:1989, Code of Practice for Earth filling for Residential Development. In particular, any areas to receive fill should be stripped of all vegetation, topsoil, non-engineered fill, soft or organic soils prior to fill placement.

Fill may comprise clean native (site won) sandy gravel or silty soils, or clean imported soils and / or granular fill, compacted to achieve no less than 95% of maximum dry density. Fill faces steeper than 1V:1H and higher than 600 mm should be retained and referred back to ENGEO. Although unlikely, where any springs or groundwater seeps are encountered, they should be intercepted with suitable drainage and discharged to a Council approved outlet.

All unretained batters of pond and stormwater drains constructed with the native sandy gravel material should be at an inclination no steeper than 1V:3H, with protection schemes in place to control erosion of the formed batters within the waterways.

A comprehensive earthworks specification should be provided to the earthworks contractor prior to starting excavations and an inspection / testing regime agreed, along with a robust erosion and sediment control plan.

6.2 Subdivision Roading

Vegetation, any organic or deleterious material, topsoil and non-engineered fill under pavement areas should be removed from the site prior to aggregate placement. Based on our observations during testing, we consider the native ground below the topsoil at the site should provide an adequate subgrade for the proposed pavement areas.

6.3 Stormwater Control

Concentrated stormwater flows from all impermeable areas must be collected and carried in sealed pipes to the Council system or an alternative disposal point subject to approval from Council. Uncontrolled stormwater must not be allowed to saturate the ground as this will potentially affect future foundation performance both statically and during future seismic activity.

6.4 Foundations

Foundations for future proposed residential dwellings within the subdivision may comprise shallow pad, strip, or slab foundations designed in accordance with the provisions of NZS 3604 Timber Framed Buildings.

Site specific testing will be required for Building Consent, to confirm the bearing materials and capacity. For preliminary design, we anticipate that a geotechnical Ultimate Bearing Capacity of 300 kPa may be assumed for foundations bearing on native sandy gravel or engineered fill, below any topsoil. All topsoil shall be stripped from within building footprints. We anticipate building pad excavations to be typically 0.3 m depth based on our subsurface investigations.



6.5 Additional Considerations

The following should also be considered in further stages of the development:

- Development of an earthworks specification addressing site grading.
- Review of the geotechnical aspects of the site grading and foundation plans.
- Geotechnical observations and testing during construction.
- Lot specific geotechnical reports.

7 References

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- The Ministry of Business, Innovation, and Employment (2016). New Zealand Geotechnical Database. Retrieved August 2020, from https://www.nzgd.org.nz.



8 Limitations

- i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, Hughes Developments Ltd, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.
- ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the client's brief and this report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.
- iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.
- iv. This Limitation should be read in conjunction with the Engineering NZ/ACENZ Standard Terms of Engagement.
- v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (03) 328 9012 if you require any further information.

Report prepared by

Report reviewed by

Jed Watts

Engineering Geologist

Don Bruggers, CMEngNZ (CPEng)

Principal Engineer





APPENDIX 1:

Site Plan and Inferred Paleo Channels







APPENDIX 2:

ENGEO Hand Auger and Test Pit Logs





Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/08/2020 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Max Test Pit Depth : 1.95 m Reviewed By: JRW Latitude: 172.37761

Digger Type/Size : Bucket Excavator Longitude : -43.62372 Bucket Type/Size : 500 mm

Excavatability (Relative Scale) DESCRIPTION SITY fine to medium SAND with trace gravel and rootlets; brown. Peorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth. Depth of Excavation: 1.95 m Termination Condition: Target depth								Bucket Type/Size :	500 mm					Longitud	∋ : -43	.623	12	
Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth. GW Tightly Packed Depth of Excavation: 1.95 m	Depth (m BGL)	Material	(Relative	Scal	e) .	USCS Symbol	DESC	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo	ows	per 1	
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Depth of Excavation: 1.95 m Termination Condition: Target depth	- 1.5 - - - -											w						
	2.0 - - -						Depth of Excavation Termination Cond	on: 1.95 m ition: Target depth										
	Tes	t pit	met targe	et dep	th at	t 1.9	5 m.											



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/08/2020 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Max Test Pit Depth : 2 m Reviewed By: JRW

Digger Type/Size : Bucket Excavator Latitude: 172.37648 Longitude: -43.62369 Bucket Type/Size : 500 mm

Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth. GW Tightly Packed	Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth. GW Tightly Packed W W							Bucket Type/Size :	500 mm					Longitud	e : -4	3.62	369		
Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth. GW Tightly Packed	Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth. GW Tightly Packed Depth of Excavation: 2 m	Depth (m BGL)		(Relativ	atabi ⁄e Sc	ale)	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	В	lows	per	100m	nm
1.0 — WOUNTIEN GW 1.5 — WOUNTIEN GW	GW Solution: 2 m	- - - 0.5 -				-		gravel and rootlets; brown. Poorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to	\$ \frac{1}{2} \fra			M			•	•			
1.5 -	Depth of Excavation: 2 m	- - - 1.0—	LUVIUM				GW	Rootlets encountered up to 0.6 m depth.					Tightly Packed						
2.0 Depth of Excavation: 2 m	Depth of Excavation: 2 m	- 1.5 - - -	AL									w							
- Termination Condition: Target depth		2.0— - - -						Depth of Excavation: 2 m Termination Condition: Target depth											
		Sca	ıla Pe	met tarç	eter	met	practi	n. cal refusal at 0.3 m depth. cencountered											



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/08/2020 $\textbf{Logged By}: \mathsf{JC/RB/JW}$ Max Test Pit Depth : 1.9 m Reviewed By: JRW Latitude: 172.37681

Digger Type/Size : Bucket Excavator Bucket Type/Size : 500 mm Longitude : -43.62288

				123	00	Bucket Type/Size : 5	00 mm					Longitude	: -4	3.62	288		
Depth (m BGL)	Material	Excav (Relati	vatab ve So	Harder Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Е	Blows	s per	100	
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- 0.5 - -						Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse.				М					•		\ \ !
-	-					Rootlets encountered up to 0.6 m depth.											
1.0 - -	ALLUVIUM				GW						Tightly Packed						
- - 1.5 -										w							
-																	
2.0 - - -	-					Depth of Excavation: 1.9 m Termination Condition: Target depth											
_													-		<u>:</u>		
Sca Sta	ic pit ala Pe nding	rnet tar enetron g groun	get d neter idwat	epth met ter wa	at 1.9 practi as not) m. ical refusal at 0.5 m depth. : encountered											



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/08/2020 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Max Test Pit Depth : 2 m Reviewed By: JRW Digger Type/Size : Bucket Excavator Latitude: 172.37574

Longitude: -43.62268 Bucket Type/Size : 500 mm

						Bucket Type/Size .	000 111111					Longitude	7 . - 4·	3.02	200		
Depth (m BGL)	Material	Easier (Rela	avatal tive S	y tilic Harder Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)			Pene per	100n	
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- 1.0— - -	ALLUVIUM				GW						Tightly Packed						
- 1.5 - - - -										W							
2.0 - - -		;	; 	;		Depth of Excavation: 2 m Termination Condition: Target depth											
Tes	t pit :	met ta	arget (depth	at 2 r	n. ical refusal at 0.3 m depth.											



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/08/2020 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Max Test Pit Depth : 2 m Reviewed By: JRW Latitude: 172.37715

Digger Type/Size : Bucket Excavator Longitude: -43.62459 Bucket Type/Size : 500 mm

Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with minor								Bucket Type/Size . 3	וווווו טטכ					Longitude	-	13.02	245	5		
Sitty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.5 m depth. M Tightly Packed Depth of Excavation: 2 m	a	cav ativ	vat ive	itab e S	Sca	le)	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	E	Зlow	/s pe	er 10	00m	m
Sarity in the to coarse GRAVEL with mind cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.5 m depth. GW Tightly Packed 1.5 - Depth of Excavation: 2 m								gravel and rootlets; brown. Poorly graded [TOPSOIL].	17 · 77 · 17 · 77 · 77 · 77						•		<u> </u>			
1.5 - Depth of Excavation: 2 m								coarse.				М								<u></u>
2.0 Depth of Excavation: 2 m							GW						Tightly Packed							•
Depth of Excavation: 2 m												W								
					•			Depth of Excavation: 2 m Termination Condition: Target depth	,••											
	O	ron	me	ete	er m	net	at 2 r pract as not	m. ical refusal at 0.3 m depth. t encountered												



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd:

Date: 27/08/2020

Max Test Pit Depth: 2.1 m

Digger Type/Size: Bucket Excavator

Shear Vane No: N/A

Logged By: JC/RB/JW

Reviewed By: JRW

Latitude: 172.37715

Digger Type/Size: Bucket Excavator

Bucket Type/Size: 500 mm

Latitude: 172.37715

Longitude: -43.62459

				Bucket Type/Size . 3	00 111111					Longitude	43	.024	J		
Depth (m BGL)	Material	Excavatability (Relative Scale	Symbo	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blo	ows p	er 1		ım
	TOPSOIL		SM	Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL].				-	L		•				12
0.5	-			Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.5 m depth.				М			•			····/	\/\>\
1.0-	ALLUVIUM		GW						Tightly Packed						
1.5	-							W							
2.00	-			Depth of Excavation: 2.1 m Termination Condition: Target depth	X										



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/08/2020 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Max Test Pit Depth : 2.1 m Reviewed By: JRW Digger Type/Size : Bucket Excavator Latitude: 172.37798

		129	903	Bucket Type/Size : 5			.01			Longitude	: -43.62		
Depth (m BGL)	Material	cavatability ative Scale) Depte	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Blows	s per	ım
-	TOPSOIL		SM	Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL].	1/ · 2/ · 1/ 1/ · 2/ · 1/				L-MD		•		
0.5 - - - - 1.0- - - - -	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth. Lens of loosely packed coarse gravel with limited fines approximately 100 mm thick encountered at 1.1 m depth.				M	Tightly Packed				>>1
1.5 -	-			Lens of loosely packed coarse gravel with limited fines approximately 100 mm thick encountered at 1.7 m depth.				W					
-				Depth of Excavation: 2.1 m Termination Condition: Target depth									



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 27/08/2020 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Max Test Pit Depth : 2.1 m Reviewed By: JRW Latitude: 172.37998

Digger Type/Size : Bucket Excavator Longitude: -43.62481 Bucket Type/Size : 500 mm

Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL].		ket Type/Size . 500 i	11111				43.0240	· I
Sity fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. GW Tightly Packed Depth of Excavation: 2.1 m	ve Scale)	TION C	Graphic Symbol Elevation (mRL)	Water Level Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blows po	er 100mm
Subrounded to rounded. Sand, fine to coarse. GW Tightly Packed N Depth of Excavation: 2.1 m	Silty fine to medium SAN gravel and rootlets; brown [TOPSOIL]. Sandy fine to coarse GR.	n. Poorly graded	₹. 77 ₹. 74				•	
Tightly Packed Depth of Excavation: 2.1 m	subrounded to rounded.	Sand, fine to		M				
Depth of Excavation: 2.1 m	GW				Tightly Packed			
Depth of Excavation: 2.1 m				W				
	Depth of Excavation: 2.1 Termination Condition: Ta	m arget depth	6					
	neter	epth at 2.1 m. met practical refusal at 0.3 m depth er was not encountered	met practical refusal at 0.3 m depth.					



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 27/08/2020 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Max Test Pit Depth : 2.1 m Reviewed By: JRW Latitude: 172.37847

Digger Type/Size : Bucket Excavator Longitude: -43.62461 Bucket Type/Size : 500 mm

Excavatability (Relative Scale) Part P	Harder Nambo	Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to	S. S. S. S. Graphic Symbol	Elevation (mRL)	Water Level		L-MD	Shear Vane Peak/Remolded (KPa)	Blows	s per 1	00mm
SM Sitty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. GW Tightly Packed Depth of Excavation: 2.1 m		gravel and rootlets; brown. Poorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to	(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)			M	L-MD				
Cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. GW Tightty Packed Debth of Excavation: 2.1 m	GW	cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to			_	M					
GW Tightly Packed 2.0 Depth of Excavation: 2.1 m	GW				-						
Depth of Excavation: 2.1 m							Tightly Packed				
Depth of Excavation: 2.1 m						W					
		Depth of Excavation: 2.1 m Termination Condition: Target depth									
			target depth at 2.1 m.	target depth at 2.1 m.	target depth at 2.1 m.	target depth at 2.1 m.	target depth at 2.1 m.	target depth at 2.1 m.	target depth at 2.1 m. rometer met practical refusal at 0.4 m depth. undwater was not encountered	target depth at 2.1 m.	target depth at 2.1 m.



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd:

Date: 27/08/2020

Max Test Pit Depth: 2.2 m

Digger Type/Size: Bucket Excavator

Shear Vane No: N/A

Logged By: JC/RB/JW

Reviewed By: JRW

Latitude: 172.37831

Digger Type/Size: Bucket ExcavatorLatitude: 172.37831Bucket Type/Size: 500 mmLongitude: -43.62379

					Bucket Type/Size : 5	UU mm					Longitude	3 : -43.62379
Depth (m BGL)	Material	Excavatabilit (Relative Scal	USCS Symbol	DES	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm 2 4 6 8 10 12
-	TOPSOIL		SM	gravel and rootlet [TOPSOIL].	m SAND with trace s; brown. Poorly graded m SAND with trace					L-MD		
_	٢		SM		vn with orange mottles.					MD		
1.0 —	ALLUVIUM		GW	Sandy fine to coa cobbles; greyish to subrounded to rot coarse.	rse GRAVEL with trace brown. Well graded, unded. Sand, fine to acked coarse gravel with eximately 100 mm thick				W	Tightly Packed		
-				encountered at 2. Depth of Excavati		, •						
-				Termination Cond	lition: Target depth							
											ı	<u> </u>

Test pit met target depth at 2.2 m.

Scala Penetrometer met practical refusal at 0.3 m depth.



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/08/2020 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Max Test Pit Depth : 2.1 m Reviewed By: JRW Latitude: 172.37929

Digger Type/Size : Bucket Excavator Bucket Type/Size : 500 mm Longitude: -43.62371

				120		Bucket Type/Size : 5	500 mm					Longitude	: -4	3.62	371		
Depth (m BGL)	aterial	Exca (Relati	vatab ive S	y (ella)	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	В	Blows	Penet	100m	nm
	TOPSOIL Material	Ш	:	エ	SM	Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL].	1/ · ½·//	Ш	5	Σ	L-MD	ш	2 :	4	6 8	3 10) 12
- - 0.5 - - -	<u>О</u> Т					Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse.				М				/		······································	
- 1.0 - -	ALLUVIUM				GW						Tightly Packed						
- 1.5 - - -										W							
- 2.0—																	
- -		;	•	;		Depth of Excavation: 2.1 m Termination Condition: Target depth											
Tesi Sca Star	t pit i ila Pe	met ta enetror g grour	rget o	depth met	at 2.1 practi	I m. ical refusal at 0.3 m depth. t encountered											



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/08/2020 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Max Test Pit Depth : 2.1 m Reviewed By: JRW Latitude: 172.37963

Digger Type/Size : Bucket Excavator Bucket Type/Size : 500 mm Longitude : -43.62408

						Bucket Type/Size :	500 mm					Longitude	e : -4:	3.62	408		
Depth (m BGL)	Material	Excava (Relative	tability e Scale Larger Hauder	Į ž	DES	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	В	lows	Penet	100m	nm
-	Τ_	ш : : :	<u> </u>	SM	Silty fine to mediu gravel and rootlets [TOPSOIL].	m SAND with trace s; brown. Poorly graded		ш	>	2	L-MD		:	4	6 8	3 10	12
0.5 -					cobbles; greyish b	rse GRAVEL with trace brown. Well graded, unded. Sand, fine to	TO THE PROPERTY OF THE PROPERT			М						\	
- 1.0 - -	ALLUVIUM			GW							Tightly Packed						
- 1.5 - - -										W							
2.0							は										
-					Depth of Excavati Termination Cond	on: 2.1 m lition: Target depth											
Test Sca	t pit i	met targe enetrome	et depth eter me	n at 2.º t pract	1 m. ical refusal at 0.3 n t encountered	n depth.											



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/08/2020 $\textbf{Logged By}: \mathsf{JC/RB/JW}$ Max Test Pit Depth : 2 m Reviewed By: JRW

Digger Type/Size : Bucket Excavator Latitude: 172.38028 Longitude : -43.62302 Bucket Type/Size : 500 mm

			120	.00	Bucket Type/Size	500 mm					Longitude	: -4	3.62	302		
Depth (m BGL)	aterial	Excavatal (Relative S	y tarder Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)				tromet	
0.5 -	TOPSOIL Material		当 	§∩ ∖SMJ	Silty fine to medium SAND with trace gravel and rootlets; brown. Poorly graded [TOPSOIL]. Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse.	JO A WAY	ä	M	M	MD MD	<u>a</u> .	2	4	6 8	3 10	12
- 1.0 - -	ALLUVIUM			GW						Tightly Packed						
- 1.5 - - - -									w							
2.0— - - -					Depth of Excavation: 2 m Termination Condition: Target depth											
Sca	la Pe	met target enetromete	r met	practi	ical refusal at 0.2 m depth	= TOPS(OII									



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/08/2020 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Max Test Pit Depth : 1.9 m Reviewed By: JRW Latitude: 172.37768

Digger Type/Size : Bucket Excavator Longitude: -43.62311 Bucket Type/Size : 500 mm

SCS Symbo (m BG Schear Van eak/Remol/ (RPa) (RPa)	SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth. GW Tightly Packed Depth of Excavation: 1.9 m							Bucket Type/Size :	000 mm					Longitude	e: -43.6	2311		
SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, submitted to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth. GW Tightly Packed Depth of Excavation: 1.9 m	SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth. GW Tightly Packed Depth of Excavation: 1.9 m	Depth (m BGL)	Material	(Relative	Scale)	USCS Symbol	DES	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blow	/s per	100	mm
Depth of Excavation: 1.9 m	Depth of Excavation: 1.9 m	- - - 0.5 - -					Sandy fine to coa cobbles; greyish to subrounded to rou coarse.	rse GRAVEL with minor rown. Well graded, unded. Sand, fine to				М						
Depth of Excavation: 1.9 m	Depth of Excavation: 1.9 m	- 1.0— - -	ALLUVIUM			GW							Tightly Packed					
Depth of Excavation: 1.9 m 2.0— Termination Condition: Target depth	Depth of Excavation: 1.9 m Termination Condition: Target depth	- 1.5 - - -										W						
		2.0— - - -					Depth of Excavati Termination Cond	on: 1.9 m lition: Target depth										
		Sca	ıla Pe	met targe	er met	pract) m. ical refusal at 0.3 n t encountered	n depth.										



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A

Date: 27/08/2020 Logged By: JC/RB/JW

Max Test Pit Depth: 1.9 m Reviewed By: JRW

Digger Type/Size: Bucket Excavator Latitude: 172.37693

Digger Type/Size : Bucket Excavator Latitude : 172.37698

Bucket Type/Size : 500 mm Longitude : -43.6222

				Bucket Type/Size . 30	50 111111					_ong.taat	5 . -4 3.0222
Depth (m BGL)	Material	Excavatability (Relative Scale) Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm 2 4 6 8 10 12
0.5 -	TOPSOIL		ML	SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth.				М	St-VSt		*
1.0 - - - - - 1.5 -	ALLUVIUM		GW					w	Tightly Packed		
2.0				Depth of Excavation: 1.9 m Termination Condition: Target depth							

Test pit met target depth at 1.9 m. Scala Penetrometer met practical refusal at 0.3 m depth.



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd:

Date: 27/08/2020

Max Test Pit Depth: 1.9 m

Digger Type/Size: Bucket Excavator

Shear Vane No: N/A

Logged By: JC/RB/JW

Reviewed By: JRW

Latitude: 172.37714

Bucket Type/Size: 500 mm Latitude: 172.37/14

Latitude: 172.37/14

Latitude: 43.62138

				Bucket Type/Gize : 60							. 10.0 <u>2</u> 100	<u> </u>
Depth (m BGL)	Material	Excavatability (Relative Scale) Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Pen Blows pe	
-	TOPSOIL		ML	SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL]. Sandy fine to coarse GRAVEL with minor cobbler; gravish brown. Well graded					St-VSt			
0.5 -				cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth.	XXXX			M				>>
1.0	ALLUVIUM		GW						Tightly Packed			
1.5 -					XXX			W				
2.0		1 ; ; ;		Depth of Excavation: 1.9 m Termination Condition: Target depth								

Test pit met target depth at 1.9 m. Scala Penetrometer met practical refusal at 0.4 m depth. Standing groundwater was not encountered



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 27/08/2020 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Max Test Pit Depth : 1.9 m Reviewed By: JRW **Latitude**: 172.378

Digger Type/Size : Bucket Excavator Bucket Type/Size : 500 mm Longitude: -43.62249

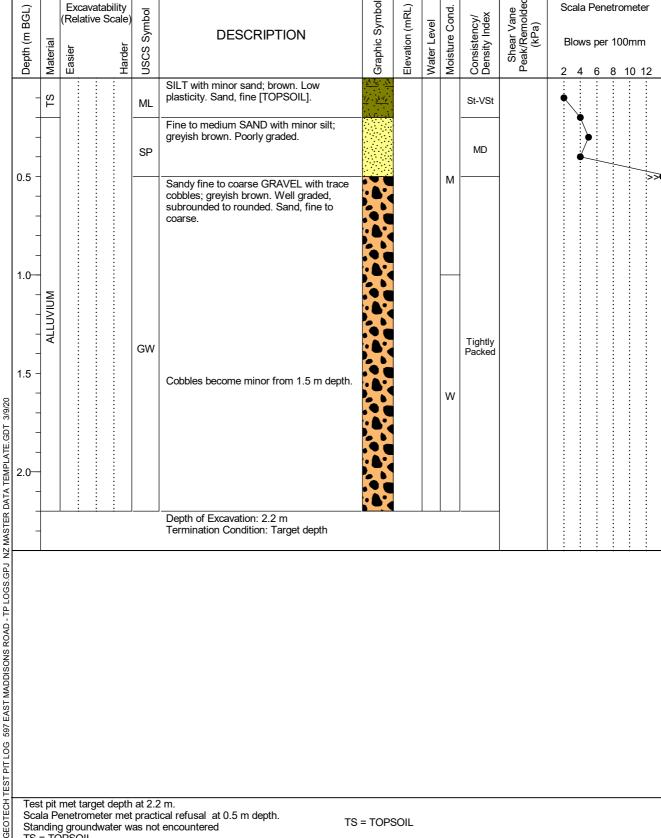
			120		Bucket Type/Size : 5	ou mm					Longitude	: -4	·3.02	.249		
Depth (m BGL)	Material	Excava (Relative	tability e Scale) Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Е	Blows	s per	100	
	TOPSOIL			ML	SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL].	1/2 3 1/2 3	ш	>	2	St-VSt	_	2	4	6	8 1	0 12
- 0.5 - - -					Sandy fine to coarse GRAVEL with minor cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth.	S S S S S S S S S S S S S S S S S S S			M							
- 1.0 - -	ALLUVIUM			GW						Tightly Packed						
- 1.5 - - -									W							
- 2.0— - - -			<u>;</u>		Depth of Excavation: 1.9 m Termination Condition: Target depth											
												<u>:</u>		<u>:</u>		



Geotechnical Investigation 597 East Maddisons Road Faringdon

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 28/08/2020 Logged By : JC/RB/JW Max Test Pit Depth : 2.2 m Reviewed By: JRW Latitude : 172 38001 Digger Type/Size · Bucket Excavator

129	03	Bucket Type/Size : 50			iOi				e : -43.62263
Excavatability (Relative Scale)	nbol	•	ymbol	mRL)	el	Sond.	cy/ dex	/ane nolded a)	Scala Penetr





Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd:

Date: 28/08/2020

Max Test Pit Depth: 2 m

Digger Type/Size: Bucket Excavator

Shear Vane No: N/A

Logged By: JC/RB/JW

Reviewed By: JRW

Latitude: 172.37898

Digger Type/Size: Bucket ExcavatorLatitude: 172.37898Bucket Type/Size: 500 mmLongitude: -43.62251

				Bucket Type/OIZC : of						. 5	
Depth (m BGL)	Material	Excavatability (Relative Scale)	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm 2 4 6 8 10 12
	OPSOIL		ML	SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL].	\(\bar{1}\) \(\bar				VSt		•
1.0-	ALLUVIUM TC		GW	Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth.				M	Tightly Packed		
2.0-				Depth of Excavation: 2 m Termination Condition: Target depth							

Test pit met target depth at 2 m.

Scala Penetrometer met practical refusal at 0.3 m depth.



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd:

Date: 28/08/2020

Max Test Pit Depth: 2 m

Digger Type/Size: Bucket Excavator

Reviewed By: JC/RB/JW

Reviewed By: JRW

Latitude: 172.38064

		129	03		Bucket Type/Size			.Oi				• : -43.622	
Depth (m BGL)	Material	avatability ative Scale) Harder Harder	USCS Symbol	DES	CRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blows p	per 100mm
-	TOPSOIL		ML	SILT with minor s plasticity. Sand, fi		1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2				St-VSt			
-			SP	Fine to medium S greyish brown. Po	AND with minor silt; orly graded.					MD			
0.5 1.0	ALLUVIUM		GW	cobbles; greyish be subrounded to rou coarse.	rse GRAVEL with trace vrown. Well graded, unded. Sand, fine to ered up to 0.6 m depth.				M	Tightly Packed			À
1.5 -	-			Depth of Excavation Cond	on: 2 m lition: Target depth				W				

Test pit met target depth at 2 m.

GEOTECH TEST PIT LOG 597 EAST MADDISONS ROAD - TP LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT 3/9/20

Scala Penetrometer met practical refusal at 0.6 m depth.



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client : Hughes Developments Ltd Shear Vane No : N/A Date: 28/08/2020 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Max Test Pit Depth: 2.1 m Reviewed By: JRW Digger Type/Size : Bucket Excavator Latitude: 172.38041

Longitude : -43.62195

Bucket Type/Size : 500 mm

	BGL)		Excavatal (Relative S	oility Scale)	Symbol		symbol	(mRL)	/el	Cond.	ncy/	Vane molded a)	Scala Penetrometer
	Depth (m BGL)	Material	Easier	Harder	USCS Sy	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Blows per 100mm 2 4 6 8 10 12
		TOPSOIL			ML	SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL].	7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 .	Ш		2	St-VSt		• 0 0 10 12
	-				SP	Fine to medium SAND with minor silt; greyish brown. Poorly graded.					L-MD		
	0.5 - - - -					Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse.				M			>>
	1.0 - - -	ALLUVIUM			GW						Tightly Packed		
3/9/20	- 1.5 - - - -					Sand lens from 1.6 m to 1.8 m depth observed in the side wall of the test pit.				W			
ATA TEMP	2.0-					Depth of Excavation: 2.1 m	谷						
MASTER D	-					Termination Condition: Target depth							
GEOTECH TEST PIT LOG 597 EAST MADDISONS ROAD - TP LOGS.GPJ NZ MASTER DATA TEMPLATE.GDT													
деотесн.	Sca	ala Pe	met target o enetromete g groundwa	r met	practi	m. cal refusal at 0.5 m depth. encountered							



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client : Hughes Developments Ltd Shear Vane No : N/A Date : 28/08/2020 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Max Test Pit Depth : 2 m Reviewed By: JRW Digger Type/Size : Bucket Excavator Latitude: 172.3809

Longitude: -43.621 Bucket Type/Size : 500 mm

					Bucket Type/Size	300 111111					Longituu	C4	3.02	<u>'</u>		
Depth (m BGL)	Material	Excava (Relative	tability e Scale	Symbo	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)			s per	100	neter mm 0 12
-	TOPSOIL			ML	SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL].					St-VSt		•				
					Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth.				M							
1.0 - - -	ALLUVIUM			GW						Tightly Packed						
1.5 - - - -					Cobbles become minor from 1.5 m depth.				W							
2.0 - -					Depth of Excavation: 2 m Termination Condition: Target depth											
_																, , , , , , , , , , , , , , , , , , , ,



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd:

Date: 28/08/2020

Max Test Pit Depth: 2 m

Digger Type/Size: Bucket Excavator

Shear Vane No: N/A

Logged By: JC/RB/JW

Reviewed By: JRW

Latitude: 172.3783

Longitude : -43.62165

Bucket Type/Size : 500 mm

Depth (m BGL)	Material	Excavatability (Relative Scale) Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm 2 4 6 8 10 12
-	TOPSOIL		ML	SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL].	1/. 1/. 1				L-MD		•
0.5	F		GW	Sandy fine to coarse GRAVEL with trace rootlets; brownish grey. Well graded, subrounded to rounded. Sand, fine to coarse.	DAX DAX			М	Tightly Packed		>>
-			SP	Fine to medium SAND with trace silt; greyish brown. Poorly graded.					MD-D		
1.0 – 1.5 – 1.5 – 2.0 –	ALLUVIUM		GW	Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse.				w	Tightly Packed		
2.0		1 ; ; ;		Depth of Excavation: 2 m Termination Condition: Target depth			L				
- NAS EF											

Test pit met target depth at 2 m.

Scala Penetrometer met practical refusal at 0.3 m depth.



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 28/08/2020 $\textbf{Logged By}: \mathsf{JC/RB/JW}$ Max Test Pit Depth : 2.2 m Reviewed By: JRW Digger Type/Size : Bucket Excavator Latitude: 172.37851

Bucket Type/Size : 500 mm **Longitude**: -43.6208

			120		Bucket Type/Size	500 mm					Longitude	: -4	3.620	8	
Depth (m BGL)	Material	Excavata (Relative S	Harder Harder	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)				omete
<u>ă</u>	TS	й	Ĭ	ň ML	SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL].	<u></u>		W	Σ	St-VSt	С.	2 ÷	4	6 8	10 1
0.5 -					Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.6 m depth.				М			•			-
1.0-	ALLUVIUM			GW						Tightly Packed					
- 1.5 - - -	A								w						
- 2.0-															
-		- 	_ ;		Depth of Excavation: 2.2 m Termination Condition: Target depth										
Test	t pit ı	met target	depth	at 2.2	2 m. ical refusal at 0.4 m depth. ⊤c										



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date: 28/08/2020 $\textbf{Logged By}: \mathsf{JC/RB/JW}$ Max Test Pit Depth : 2.1 m Reviewed By: JRW

Digger Type/Size : Bucket Excavator Latitude: 172.37952 Longitude : -43.62084 Bucket Type/Size : 500 mm

					Bucket Type/Size . 5	1 1						3 43.02004
Depth (m BGL)	Material	Excavatabi (Relative So	Harder (ale)	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Peak/Remolded (kPa)	Scala Penetrometer Blows per 100mm 2 4 6 8 10
-	TS			ML	SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL].	\(\frac{1}{12}\cdot \frac{1}{12}\cdot \frac{1}{1				St-VSt		•
0.5 -			-	ML	Sandy SILT; greyish brown. Low plasticity. Sand, fine to medium.				М	St-VSt		
-			-		Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse.	DOC S						
1.0— - -	ALLUVIUM			GW		COCC COCC				Tightly Packed		
1.5 -									w	rackeu		
2.0												
-					Depth of Excavation: 2.1 m Termination Condition: Target depth							
Sca Star	la Pe ndino	met target d enetrometer g groundwat	met	practi	ical refusal, at 0.5 m donth	= TOPS	SOIL					



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Shear Vane No: N/A Date : 28/08/2020 $\textbf{Logged By}: \mathsf{JC/RB/JW}$ Max Test Pit Depth : 2 m Reviewed By : JRW

Digger Type/Size : Bucket Excavator Latitude: 172.38036 Longitude: -43.61991 Bucket Type/Size : 500 mm

SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL]. Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. M Rootlets encountered up to 0.8 m depth. GW Tightly Packed	Depth (m BG) Material Easier Naterial	lative Scale) Harder CSCS Sympto	SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL]. Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to	Graphic Symbol	Elevation (mRL)	Moisture Cond.		Shear Vane Peak/Remolded (KPa)	Blow	s per 1	
SILT with minor sand; brown. Low plasticity. Sand, fine [TOPSOIL]. Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. Rootlets encountered up to 0.8 m depth. GW Tightly Packed	- <u>S</u>		plasticity. Sand, fine [TOPSOIL]. Sandy fine to coarse GRAVEL with trace cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to	D 24 24 24 24 24 24 24 24 24 24 24 24 24		S W		а.	2 4	6 8	
cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to coarse. M Rootlets encountered up to 0.8 m depth. Tightly Packed W Tightly Packed	0.5 -		cobbles; greyish brown. Well graded, subrounded to rounded. Sand, fine to								
GW Tightly Packed W	-					М					
	1.0 — NIN — O.1	GW	Rootlets encountered up to 0.8 m depth.				Tightly Packed				
	1.5 -					W					
Depth of Excavation: 2 m Termination Condition: Target depth	2.0		Depth of Excavation: 2 m Termination Condition: Target depth								



LOG OF AUGER HA01

Geotechnical Investigation 597 East Maddisons Road Faringdon

Client: Hughes Developments Ltd Client Ref. : N/A Date : 27/08/2020 Hole Depth: 0.3 m

Shear Vane No : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Reviewed By: JRW **Latitude**: 172.37683

			12903	Hole De Hole Diame	pth : 0. eter : 50	3 m) mm				Lor	atitude: 172.37 ngitude: -43.624	
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Pen	
Deg	Mai	SN	Silty fine to medium SAND with tra	ace gravel and	Gra	Еle	Wa	Moi	Cor	Un Or	2 4 6	8 10 12
0.1 -	TOPSOIL	SM	Silty fine to medium SAND with tra rootlets; brown. Poorly graded [TO	PSÖIL].				M	MD		•	
0.2 -												
0.3 -			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal	le vii .							
0.4 -	-											
0.5 -	-											
0.6 -	-											
0.7 -	-											



Geotechnical Investigation 597 East Maddisons Road Faringdon

Shear Vane No : N/A Client: Hughes Developments Ltd Client Ref. : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Date : 27/08/2020 Hole Depth: 0.3 m

Reviewed By : JRW Latitude: 172.37732

			12903	Hole De Hole Diame	pth : 0. eter : 50	3 m 0 mm						de : 1 de : -				
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded					omet	
De	Ma	SN	SILT with some sand, trace gravel	and rootlets:	<u>7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7</u>	Ш	We	Mo	<u>ē</u> S	L L Q g	2	<u>4</u>	6	8	10	12
).1 -	TOPSOIL	ML	SILT with some sand, trace gravel brown. Low plasticity. Sand, fine [ropsoil].				M	St-VSt		•					
0.2 -	L															
0.3 -			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal									\	\		
															\hat{\chi}	\
0.4 -																
0.5 -	_															
0.6 -	_															
0.7 -																



Geotechnical Investigation 597 East Maddisons Road Faringdon

Shear Vane No : N/A Client: Hughes Developments Ltd Client Ref. : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Date : 27/08/2020 Reviewed By : JRW Hole Depth: 0.3 m

Latitude: 172.37643

			12903	Hole De Hole Diame	pth : 0. eter : 50	3 m 0 mm						de : 1 de : -4				
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala			ometo	
<u>ă</u>	M	<u> </u>	SILT with some sand, trace gravel brown. Low plasticity. Sand, fine [and rootlets; FOPSOIL].	19 34 34 34 34 34 34 34 34 34 34 34 34 34	<u>ū</u>	W	M	33	5 % 6	2	4	6	8	10	12
0.1 -	TOPSOIL	ML						M	St-VSt		• • • • • • • • • • • • • • • • • • •					
0.2 -	TOP	IVIL														
0.3 -			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal									•			
0.4 -																
0.5 -	_															
0.6 -																
0.7 -	_															



Geotechnical Investigation 597 East Maddisons Road Faringdon

Client: Hughes Developments Ltd Client Ref. : N/A Date : 27/08/2020

Shear Vane No : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Reviewed By : JRW Latitude: 172.37611

Hole Depth : 0.3 m

			12903	Hole Diameter						Lor	gituc				ı	
ש (BGL		ymbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	ivel	Cond.	ncy/ ndex	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Sca	la Pe	enetro	omet	er
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		raphic	levatior	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Indraine Strengt Peak/Re	•				00mn	
0.1 -		_ ר	Silty fine to medium SAND with tra rootlets; brown. Poorly graded [TO			ш	>	2	011		2	4	6	8	10	12
0.2 -	TOPSOIL	SM		<u> </u>	\$\frac{\delta}{\delta} \frac{\delta}{\delta}			M	MD				\			
0.3 -			End of Hole Depth: 0.3 m Termination Condition: Practical re	fusal	(). (1),											
0.4 -																\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
0.5 -	_															
0.6 -	-															
0.7 -																
												:				



Geotechnical Investigation 597 East Maddisons Road Faringdon

Client: Hughes Developments Ltd Client Ref. : N/A Date : 27/08/2020 Hole Depth: 0.3 m

Shear Vane No : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Reviewed By : JRW Latitude: 172.37525

			12903	Hole De _l Hole Diame	pth : 0. ter : 50	3 m) mm				Lor		le : 17 le : -4				
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded				netror er 100		
0.1 -		ח	SILT with some sand, trace gravel brown. Low plasticity. Sand, fine [and rootlets; FOPSOIL].	9 11/2/1/2/1/2/2/2/2/2/2/2/2/2/2/2/2/2/2/	Ш	W	M	00	2.7.1	2	4	6	8	10	12
0.2 -	TOPSOIL	ML						М	St-VSt		·					
0.3 -			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal	<u> </u>											
0.4 –																·/······
0.5 -																
0.6 -	-															
0.7 -																



Geotechnical Investigation 597 East Maddisons Road Faringdon

Client: Hughes Developments Ltd Client Ref. : N/A Date : 27/08/2020 Hole Depth: 0.2 m

Shear Vane No : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Reviewed By : JRW **Latitude**: 172.38023

			12903	Hole De Hole Diame	pth : 0. eter : 50	.2 m 0 mm				Loi			72.38 43.62			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded			la Per ws pe			
۵	ž	Š	SILT with trace sand, gravel and ro Low plasticity [TOPSOIL].	ootlets; brown.	Θ	面	×	Š	٥ă	500	2	4	6	8	10	12 :
0.1 -	TOPSOIL	ML	Low plasticity [TOPSOIL].					M	St-VSt		•					
0.2 -			End of Hole Depth: 0.2 m Termination Condition: Practical re	efusal	<u>V. <u>V</u>V.</u>						•	····				
0.3 -	-															····/······
0.4 -	_															
0.5 -																
0.6 -	_															
0.7 -	-															
															:	:



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903 Client : Hughes Developments Ltd
Client Ref. : N/A
Date : 27/08/2020
Hole Depth : 0.2 m

Shear Vane No : N/A Logged By : JC/RB/JW Reviewed By : JRW Latitude : 172.37854

12903 Hole Diameter: 50 mm Longitude : -43.62532 Undrained Shear Strength (kPa) Peak/Remolded Graphic Symbol Elevation (mRL) Depth (m BGL) **JSCS Symbol** Moisture Cond. Shear Vane Consistency/ Density Index Scala Penetrometer Water Level **DESCRIPTION** Material Blows per 100mm 8 10 12 SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL]. 0.1 St-VSt Μ ML 0.2 End of Hole Depth: 0.2 m Termination Condition: Practical refusal 0.3 0.4 0.5 0.6 0.7

Hand auger met practical refusal at 0.2 m depth on inferred gravel.

Scala Penetrometer met practical refusal at 0.3 m depth.

Standing groundwater was not encountered

GEOTECH HAND AUGER 597 EAST MADDISONS ROAD - HA LOGS.GPJ NZ DATA TEMPLATE 2.GDT 3/9/20



Geotechnical Investigation 597 East Maddisons Road Faringdon

Shear Vane No : N/A Client: Hughes Developments Ltd Client Ref. : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Date : 27/08/2020

Reviewed By: JRW

			Faringdon 12903	Hole De Hole Diame		.2 m	0_0				atitud	le : 17 le : -4	72.37		
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2	Blov	vs pei	etrom 100r 8	nm
	TOPSOIL	ML	SILT with trace sand, gravel and re Low plasticity [TOPSOIL].	potlets; brown.	6 47 47 47 47 47 47 47 47 47 47 47 47 47			М	St-VSt		•	\ \ \			
0.2			End of Hole Depth: 0.2 m Termination Condition: Practical re	efusal	<u>1</u> . <u>V</u> V.										
0.3 -															
0.4 -															
0.5 -															
0.6 -															
0.7 -															



Geotechnical Investigation 597 East Maddisons Road Faringdon

Client: Hughes Developments Ltd Client Ref. : N/A Date : 27/08/2020 Hole Depth : 0.3 m

Shear Vane No : N/A $\textbf{Logged By}: \mathsf{JC/RB/JW}$ Reviewed By : JRW

			Faringdon 12903	Hole Depti Hole Diamete									72.379 3.6238		
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2		s per	tromete 100mm 8 10	
0.1 -	TOPSOIL	ML	SILT with some sand, trace gravel brown. Low plasticity. Sand, fine	and rootlets; rOPSOIL].	6. 70 7. 77 7. 77 6. 70 7.			M	St-VSt			•			
0.2 -)T		End of Hole Depth: 0.3 m	<u>1</u> <u>2</u> <u>3</u> <u>4</u> <u>4</u>											
			Termination Condition: Practical re	efusal											
0.4 -															
0.5 -															
0.6 -															
0.7 -															



Geotechnical Investigation 597 East Maddisons Road Faringdon

Client: Hughes Developments Ltd Client Ref. : N/A Date : 27/08/2020 Hole Depth: 0.2 m

Shear Vane No : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Reviewed By : JRW Latitude: 172.37909

			12903	Hole De Hole Diame						Lor	atitud Igitud	de:1 de:-4			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Blov	ws pe	netron)mm
	2	<u> </u>	SILT with trace sand, gravel and ro Low plasticity [TOPSOIL].	potlets; brown.	9 1/2 · 2 ¹ /2 · 3 ¹ /2 · 3	Ш	8	2	٥٥		2	4	6	8	10
0.1 -	TOPSOIL	ML			\$\frac{1}{2}\ldots \$1			M	St-VSt			•			
0.2 -			End of Hole Depth: 0.2 m Termination Condition: Practical re	fusal	<u>, v. v.</u>										
0.3 -															
0.4 -	_														
0.5 -															
0.6 -															
0.7 -															



Geotechnical Investigation 597 East Maddisons Road Faringdon

Shear Vane No : N/A Client: Hughes Developments Ltd Client Ref. : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Date : 27/08/2020 Reviewed By: JRW Hole Depth : 0.2 m

Latitude: 172.37797

			12903	Hole De Hole Diame						Lor	atitude ngitude				
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	E		per 1	romete	
0.1 -	TOPSOIL	ML	SILT with trace sand, gravel and re Low plasticity [TOPSOIL].	potlets; brown.	7 37 37 37 37 37 37 37 37 37 37 37 37 37		M	M	St-VSt	2%4	2	4 6	6 8	3 10	12
0.2 -			End of Hole Depth: 0.2 m Termination Condition: Practical re	fusal											>>
0.4 -	_														
0.5 -															
0.4 - 0.5 - 0.6 - 0.6 - 0.7 - 0.8															
0.8															

Hand auger met practical refusal at 0.2 m depth on inferred gravel.

Scala Penetrometer met practical refusal at 0.3 m depth.



Geotechnical Investigation 597 East Maddisons Road Faringdon

Client: Hughes Developments Ltd Client Ref. : N/A Date : 27/08/2020 Hole Depth: 0.2 m

Shear Vane No : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Reviewed By: JRW Latitude : 172.37868

			12903	Hole De Hole Diame	pth : 0. eter : 50	2 m) mm				Lor		de: 17 de: -4			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Blow	s per	etromete 100mm	1
ă	N	<u> </u>	SILT with trace sand, gravel and ro Low plasticity [TOPSOIL].	potlets; brown.	D (3/1/2) (3/1		W	M	ÖĞ	2.0	2	4	6	8 10	12
0.1 -	TOPSOIL	ML						М	St-VSt			•			
0.2 -			End of Hole Depth: 0.2 m Termination Condition: Practical re	efusal	<u>17. × 19</u> . ;										
0.3 -															
0.4 -															
0.5 -															
0.6 -															
0.7 -															



Geotechnical Investigation 597 East Maddisons Road Faringdon

Shear Vane No : N/A Client: Hughes Developments Ltd Client Ref. : N/A Date : 27/08/2020 Reviewed By : JRW Hole Depth: 0.2 m

Latitude: 172.38005

 $\textbf{Logged By} : \mathsf{JC/RB/JW}$

			12903	Hole De Hole Diame	pth : 0. eter : 50	2 m) mm				Lor		de: 17 de: -4	2.380 3.623		
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Blow	s per	tromete	1
	SOIL	ML	SILT with trace sand, gravel and ro Low plasticity [TOPSOIL].	ootlets; brown.		ш	۸	M	St-VSt		2	4	6	8 10	12
0.2			End of Hole Depth: 0.2 m Termination Condition: Practical re	fusal	<u>b. 34.</u> 36.34 16.34										
0.3 -															
0.4 -															
0.5 -															
0.6 -															
0.7 -															



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

le Diameter : 50 mm Lon

				12903	Hole Diame	eter : 50	0 mm				Lor	ngitude : -43.62349
•	Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Scala Penetrometer Blows per 100mm
)ept	/ate	SC			- 3rap	le 🤆	Vate	Aois	Sons Jens	Stre	·
	0.1 -	TOPSOIL	ML	SILT with trace sand, gravel and re Low plasticity [TOPSOIL].	potlets; brown.		ш	Λ	M	St-VSt		2 4 6 8 10 12
	0.2 -			End of Hole Depth: 0.2 m								
	0.3 -			End of Hole Depth: 0.2 m Termination Condition: Practical re	fusal							>>•
E 2.GDT 3/9/20	0.4 -											
GPJ NZ DATA TEMPLAT	0.5 -											
SONS ROAD - HA LUGS.	0.6 -											
ND AUGER 597 EAST MADDISONS ROAD - HA LOGS.GPJ NZ DATA TEMPLATE 2.GDT 3/9/20	0.7 -											

Hand auger met practical refusal at 0.2 m depth on inferred gravel. Scala Penetrometer met practical refusal at 0.3 m depth.



Geotechnical Investigation 597 East Maddisons Road Faringdon

Shear Vane No : N/A Client: Hughes Developments Ltd Client Ref. : N/A $\textbf{Logged By}: \mathsf{JC/RB/JW}$ Date : 27/08/2020 Hole Depth : 0.3 m Reviewed By: JRW Latitude : 172 3774

			12903	Hole Depth Hole Diameter		1			Lor	ngitud	e: 172 e: 43.			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala Blows	per	100m	ım
ā	Σ	<u> </u>	SILT with some sand, trace gravel brown. Low plasticity. Sand, fine [© <u>III</u> 2: 3:1/2: 3 2: 3:1/2: 3 2: 3:1/2: 3 2: 3:1/2: 3 2: 3:1/2: 3	<u> </u>	Σ	ÖĞ	23.0	2	4	6	8 1	0 1
0.1 -	TOPSOIL	ML		10 3 6 5 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6			M	St-VSt			•			
0.3 -			End of Hole Depth: 0.3 m Termination Condition: Practical re	<u>∀</u> <u>;</u> <u>;r v</u> efusal	<u>* 1</u>									
0.4 -														
0.5 -														
0.6 -														
0.7 -														



Geotechnical Investigation 597 East Maddisons Road Faringdon

Shear Vane No : N/A Client: Hughes Developments Ltd Client Ref. : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Date : 27/08/2020 Reviewed By: JRW Hole Depth: 0.3 m

Latitude: 172.37647

			12903	Hole De Hole Diame							atitude: 1 ngitude: -			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	Blo	a Penet	00mm	
0.1 -		ML	SILT with some sand, trace gravel brown. Low plasticity. Sand, fine [and rootlets; FOPSOIL].			<u> </u>	M	St-VSt		2 4	6 8	3 10	12
0.3			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal	r									>>
0.5	_													
0.6	-													
0.6 - 0.7 - 0.8 -	_													

Hand auger met practical refusal at 0.3 m depth on inferred gravel.

Scala Penetrometer met practical refusal at 0.3 m depth.



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Client Ref. : N/A Date : 27/08/2020 Hole Depth: 0.3 m

Logged By: JC/RB/JW Reviewed By: JRW Latitude: 172.37759

Shear Vane No: N/A

Hole Diameter: 50 mm Longitude: -43.62193 Shear Vane Undrained Shear Strength (kPa) Peak/Remolded Graphic Symbol Elevation (mRL) Moisture Cond. Depth (m BGL) **JSCS Symbol** Consistency/ Density Index Scala Penetrometer Water Level **DESCRIPTION** Material Blows per 100mm 6 8 SILT with some sand, trace gravel and rootlets; brown. Low plasticity. Sand, fine [TOPSOIL]. 0.1 St-VSt ML0.2 0.3 End of Hole Depth: 0.3 m Termination Condition: Practical refusal 0.4 GEOTECH HAND AUGER 597 EAST MADDISONS ROAD - HA LOGS.GPJ NZ DATA TEMPLATE 2.GDT 3/9/20 0.5 0.6 0.7

Hand auger met practical refusal at 0.3 m depth on inferred gravel.

Scala Penetrometer met practical refusal at 0.4 m depth.



Geotechnical Investigation 597 East Maddisons Road Faringdon

Client: Hughes Developments Ltd Client Ref. : N/A Date : 27/08/2020 Hole Depth : 0.3 m

Shear Vane No : N/A $\textbf{Logged By}: \mathsf{JC/RB/JW}$ Reviewed By: JRW Latitude : 172 3784

			12903	Hole Dep Hole Diame						Lor		de : 17 de : -4				
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded			s pe	r 100r	nm	
	2	<u> </u>	SILT with some sand, trace gravel brown. Low plasticity. Sand, fine	and rootlets; FOPSOIL].	\(\frac{\frac{1}{2}\cdot \frac{1}{2}\cdot \frac{1}{2}\cdo	Ш	M	2	00		2	2 4	6	8	10	12
0.1 -	TOPSOIL	ML						М	St-VSt							
0.3			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal	<u> </u>										````	·/·····
0.4 -																
0.5 -																
0.6 -																
0.7 -																
0.8 Han	nd au	uger n	net practical refusal at 0.3 m depth o	on inferred grave	el.											



Geotechnical Investigation 597 East Maddisons Road Faringdon

Client: Hughes Developments Ltd Client Ref. : N/A Date : 28/08/2020 Hole Depth : 0.2 m

 $\textbf{Logged By}: \mathsf{JC/RB/JW}$ Reviewed By: JRW

Shear Vane No : N/A

			12903	Hole De Hole Diame								le : 17 le : -4			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2		a Pen vs per 6	1001	
	TOPSOIL	ML	SILT with trace sand, gravel and re Low plasticity [TOPSOIL].	potlets; brown.	7 × 7 × 7 × 7 × 7 × 7 × 7 × 7 × 7 × 7 ×			M	St-VSt		•				
0.2 -			End of Hole Depth: 0.2 m Termination Condition: Practical re	efusal											 ·····/
0.4 -															
0.5 -															
0.7 -															



Geotechnical Investigation 597 East Maddisons Road Faringdon

Shear Vane No : N/A Client: Hughes Developments Ltd Client Ref. : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Date : 28/08/2020 Reviewed By : JRW Hole Depth : 0.2 m Latitude: 172.38005

			12903	Hole Diame						Lor			3.621		
Depth (m BGL)	al	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala	a Pene	tromet	ter
Depth	Material	JSCS			Graphi	∃levati	Nater	Moistu	Sonsis Densit	She Undra Stren Peak/	2	Blov 4		100mr 8 10	
	TOPSOIL	ML	SILT with trace sand, gravel and re Low plasticity [TOPSOIL].	potlets; brown.				М	St-VSt		•				
0.2			End of Hole Depth: 0.2 m Termination Condition: Practical re	efusal	<u>1</u> . <u>V U</u>						•				
0.3 -															<u></u>
0.4 -															
0.5 -															
0.6 -															
0.7 -															
Sca	ala P	enetro	net practical refusal at 0.2 m depth of practical refusal at 0.3 multiple at 0		⁄el.										



 $\textbf{Logged By} : \mathsf{JC/RB/JW}$

Reviewed By : JRW

Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Shear Vane No : N/A Client: Hughes Developments Ltd Client Ref. : N/A Date : 28/08/2020

Hole Depth: 0.5 m Latitude: 172.37925 **Longitude**: -43.62172 Hole Diameter : 50 mm

			noie Dialite		J 1111111					igituc	le4	0.02 1	12	
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded				etrome	
Dep	Mat	nsı		Gra	Ele	Wa	Moi	Cor Der	P. S.	2	4	6	8 10	
0.1 -	TOPSOIL	ML	SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL].					St-VSt		•				
0.2 -	_		Silhy fine to medium SAND: graviah braye				М			•				
0.4 -	ALLUVIUM	SM	Sllty fine to medium SAND; greyish brown. Poorly graded.					MD		•				
0.5 -			End of Hole Depth: 0.5 m Termination Condition: Practical refusal											>>
0.6 - 0.7 - 0.8 Hasso	_													
0.8 Ha So St	ala F	enetro	net practical refusal at 0.5 m depth on inferred grave ometer met practical refusal at 0.5 m depth. undwater was not encountered	el.						<u> </u>	:	•	<u>: :</u>	



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Client Ref. : N/A Date : 28/08/2020 Hole Depth : 0.5 m

 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Reviewed By : JRW Latitude: 172.37934

Shear Vane No : N/A

			12903	Hole Diamet						Lon	gitud	le : -4	3.622			
BGL)		mbol			Graphic Symbol	Elevation (mRL)	/el	Cond.	ncy/	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala	Pen	etron	nete	·r
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		phic S	/ation	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Iraine rength		Blow	s pei	r 100	mm	
Dep	Mat	OSC	0.7		G. 37	Ele	Wat	Moi	Con	Str. Onc.	2	4	6		10	
0.1 -			SILT with trace sand, gravel and r Low plasticity [TOPSOIL].	ootlets; brown.							•					
0.2 -	TOPSOIL	ML		7				M	St-VSt		•					
0.3 -	ALLUVIUM	SP	Fine to medium SAND with minor brown. Poorly graded.	silt; greyish					MD							
0.5 -			End of Hole Depth: 0.5 m Termination Condition: Practical re	efusal								•				
0.6 -	-															<u></u>
0.7 -	_															
			net practical refusal at 0.5 m depthometer met practical refusal at 0.6		el.										:	



Geotechnical Investigation 597 East Maddisons Road Faringdon

Client: Hughes Developments Ltd Client Ref. : N/A Date : 28/08/2020 Hole Depth : 0.4 m

 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Reviewed By : JRW Latitude: 172.37975

Shear Vane No : N/A

			12903	Hole Diameter					Lor	gitud	le : 1 le : -4				
n BGL)		ymbol	DESCRIPTION	Graphic Symbol	Elevation (mRL)	evel	Cond.	ncy/ Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scal	a Pe	netron	nete	r
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION	iraphic	levatior	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Indraine Strengt				er 100		
	V	<u> </u>	SILT with trace sand, gravel and ro Low plasticity [TOPSOIL].		1) 1) 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	>	2	00		2	4	6	8	10	12
0.1 -	TOPSOIL	ML		7 3 4 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	2 6 7 8 9 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6		М	St-VSt		•	\				
0.3 -	ALLUVIUM	SP	Fine to medium SAND with minor brown. Poorly graded.	silt; greyish	, , , , , ,			MD						······································	·····/
0.4 -			End of Hole Depth: 0.4 m Termination Condition: Practical re	fusal	·1										
0.6 -															
0.7 –															



Geotechnical Investigation 597 East Maddisons Road Faringdon

Client: Hughes Developments Ltd Client Ref. : N/A Date : 28/08/2020 Hole Depth: 0.2 m

Shear Vane No : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Reviewed By: JRW

Latitude: 172.37866

			12903	Hole De Hole Diame						Lor		2.3786 3.6220		
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded	2	s per ′	romete	
0.1	OIL	ML	SILT with trace sand, gravel and re Low plasticity [TOPSOIL].	potlets; brown.			7	M	St-VSt	-	•			
0.2			End of Hole Depth: 0.2 m Termination Condition: Practical re	efusal	<u> </u>									
0.3														>>•
0.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	_													
OAD - HA LOGS.GPJ	_													
AND AUGER 597 EAST MADDISONS ROAD - HALOGS.GPJ 0.0 2.0 6.0 9.0 9.0														
0.8												 <u>:</u>		

Hand auger met practical refusal at 0.2 m depth on inferred gravel.

Scala Penetrometer met practical refusal at 0.3 m depth.



Geotechnical Investigation 597 East Maddisons Road Faringdon

Client: Hughes Developments Ltd Client Ref. : N/A Date : 28/08/2020 Hole Depth: 0.3 m

Shear Vane No : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Reviewed By : JRW Latitude: 172.37789

			12903	Hole De Hole Diame						Lor		de : 1 de : -)	
ו BGL)		Symbol	DESCRIPTION		Symbol	ר (mRL)	evel	Cond.	ndex	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scal	a Pe	enetro	mete	er
Depth (m BGL)	Material	uscs s	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Undraine Strengt Peak/Re	2		ws p	er 10 8		າ 12
0.1 -	TOPSOIL	ML	SILT with some sand, trace gravel brown. Low plasticity. Sand, fine	and rootlets; FOPSOIL].				М	St-VSt		•					
0.2 -	TC															
0.3 -			End of Hole Depth: 0.3 m Termination Condition: Practical re	efusal	r vi							•	\			
																\
0.4 -																
).5 -																
).6 -																
													:			
).6 -).7 -).8 - Sc Sta																
										1	1 :	:	:	•		



Geotechnical Investigation 597 East Maddisons Road Faringdon

Shear Vane No : N/A Client: Hughes Developments Ltd Client Ref. : N/A Date : 28/08/2020 Hole Depth: 0.2 m

 $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Reviewed By: JRW Latitude: 172.37891

		12903	Hole De Hole Diame	pth : 0. eter : 50	2 m) mm				Lor		le : 17 le : -4			
Depth (m BGL) Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Blow	s per	tromete	
ŎŽ	<u> </u>	SILT with trace sand, gravel and ro Low plasticity [TOPSOIL].	ootlets; brown.		ū	W	Ň	<u> </u>	2 2 4	2	4	6	8 10	12
O.1 - TOPSOIL	ML			2 34 34 34 34 34 34 34 34 34 34 34 34 34			M	St-VSt						
0.2		End of Hole Depth: 0.2 m Termination Condition: Practical re	fusal	<u>v</u> <u>v</u> v										
0.3 -														· · · · · · · · · · · · · · · · · · ·
0.4 -														
0.5 -														
0.6 -														
0.7 -														
0.8 Hand a	uger n	net practical refusal at 0.2 m depth o	on inferred grav	el.										



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903 Client : Hughes Developments Ltd
Client Ref. : N/A
Date : 28/08/2020
Hole Depth : 0.4 m

Logged By: JC/RB/JW Reviewed By: JRW Latitude: 172.37915

Shear Vane No : N/A

			12903	Hole Diame						Lor		de : -43				
BGL)		mbol			ymbol	(mRL)	le/	Cond.	ncy/ ndex	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded		Scala	Pene	trome	ter	
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear ' Idraine Itrength		Blows	s per	100m	m	
De	Me	S	SILT with trace sand, gravel and re	ootlets: brown	Q.	ä	Š	Ĭ	ပိဝိ	7 2 8 8	2	2 4	6	8 1) 12	2
0.1 -	TOPSOIL	ML	Low plasticity [TOPSOIL].		元 27 27 27 27 27 27 27 27 27 27 27 27 27			М	St-VSt							
0.3 -			Fine to medium SAND with minor	silt; greyish												
	ALLUVIUM	SP	brown. Poorly graded.						MD							
0.4 -			End of Hole Depth: 0.4 m Termination Condition: Practical re	efusal												
0.5 -												•				<u></u>
0.0 -																
0.7 - 0.8																

Hand auger met practical refusal at 0.4 m depth on inferred gravel.

Scala Penetrometer met practical refusal at 0.6 m depth.



Geotechnical Investigation 597 East Maddisons Road Faringdon

Shear Vane No : N/A Client: Hughes Developments Ltd Client Ref. : N/A $\textbf{Logged By} : \mathsf{JC/RB/JW}$ Date : 28/08/2020 Reviewed By : JRW Hole Depth: 0.2 m Latitude: 172.38012

			12903	Hole De Hole Diame						Lon		de: 172 de: -43			
Depth (m BGL)	Material	USCS Symbol	DESCRIPTION		Graphic Symbol	Elevation (mRL)	Water Level	Moisture Cond.	Consistency/ Density Index	Shear Vane Undrained Shear Strength (kPa) Peak/Remolded			per 1	100mm	1
	TOPSOIL	ML	SILT with trace sand, gravel and ro Low plasticity [TOPSOIL].	potlets; brown.			\	M	St-VSt	ר (ר ז	2	4	6 8	o 10	12
0.2			End of Hole Depth: 0.2 m Termination Condition: Practical re	fusal	<u> </u>										
0.3 -															
0.4 -															
0.5 -															
0.6 -															
0.7 -															



Geotechnical Investigation 597 East Maddisons Road Faringdon 12903

Client: Hughes Developments Ltd Client Ref. : N/A Date : 28/08/2020 Hole Depth: 0.2 m

Shear Vane No: N/A Logged By: JC/RB/JW Reviewed By: JRW Latitude: 172.37978

Hole Diameter: 50 mm Longitude: -43.62013 Undrained Shear Strength (kPa) Peak/Remolded Graphic Symbol Elevation (mRL) Depth (m BGL) **JSCS Symbol** Moisture Cond. Shear Vane Consistency/ Density Index Scala Penetrometer Water Level **DESCRIPTION** Material Blows per 100mm 8 SILT with trace sand, gravel and rootlets; brown. Low plasticity [TOPSOIL]. 0.1 St-VSt Μ ML 0.2 End of Hole Depth: 0.2 m Termination Condition: Practical refusal 0.3 0.4 GEOTECH HAND AUGER 597 EAST MADDISONS ROAD - HA LOGS.GPJ NZ DATA TEMPLATE 2.GDT 3/9/20 0.5 0.6 0.7

Hand auger met practical refusal at 0.2 m depth on inferred gravel.

Scala Penetrometer met practical refusal at 0.3 m depth.



APPENDIX 3:

ECan Borelogs



Bore or Well No	M36/4346
Well Name	CNR MADDISONS & GOULDS RDS
Owner	MAIN M.R.



Well Number	M36/4346	File Number	
Owner	MAIN M.R.	Well Status	Active (exist, present)
Street/Road	CNR MADDISONS & GOULDS RDS	NZTM Grid Reference	BX23:49967-69900
Locality	ROLLESTON	NZTM X and Y	1549967 - 5169900
Location Description		Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Domestic Supply,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	26.80m	Water Level Count	0
Diameter	150mm	Initial Water Level	
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	39.12m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	15	Calc Min 80%	9.71m below MP (Estimated)
Aquifer Name	Riccarton Gravel	Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	01 Apr 1991	Max Tested Yield	6 l/s
Driller	Dynes Road Drilling	Drawdown at Max Tested Yield	5 m
Drilling Method	Cable Tool	Specific Capacity	1.33 l/s/m
Casing Material	STEEL	Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Borelog for well M36/4346

Grid Reference (NZTM): 1549968 mE, 5169901 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 39.1 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 28.5 m Drill Date: 01-Apr-1991



	/ater evel Depth(m)	Full Drillers Description	Formation Code
		No Log No Log No	Not logged	RI
		og No Log No Log I		
Н		No Log No Log No		
		No Log No Log No		
Н		No Log No Log No		
		No Log No Log No		
Н		g No Log No Log I		
- 11		No Log No Log No		
Ш	4.00m	No Log No Log No		
		0==0==0	Large to medium gravel, small amount	RI
; <u> </u>			of silt	
		12 22 22 23		
	6.00m	D==0==q		
П	0.00111		Silt	RI
Н				
	8.00m			
		0==0==0==	Gravel and silt	RI
П		1277777		
o I		0==0==0==		
° Ħ		==0==0		
- 11		$0 \stackrel{\sim}{=} 0 \stackrel{\sim}{=} 0 \stackrel{\sim}{=} 0$		
Н		00		
	11.50m	## Ø==Ø== O		
Ц		Fegaçes	Very tight clay, small shingle	RI
		0=0=0=0=0		
		0-0-0-0-0		
П		0 0 0 0 0 0 0 0 0		
- 11	14.00m	0=0=0=0=0		
Н	14.00111	00000	Tight clay and shingle	RI
- 11		000000	ngm only and annigh	
5		000000		
		00000		
Щ	16.00m	02222		
		E 2 3 2 5 2 5 2 5 2 5 2 5 5 5 5 5 5 5 5 5	Tight clay, small gravel	RI
		0=0=0=0		
П		0-0-0-0-0-0 -0-0-0-0-0-0		
	18.00m	E23252525		
н	18.50m	000000	Clay and gravel, not as tight	RI
		000000000	Gravel, some water	RI
Н	19.00m	2222222		RI
		000000	Tight clay gravel	KI
0 📕		55555		
- []		000000		
Ш	21.00m	000000		
П		000000	Tight clay and small to medium gravel,	RI
	22.00m	00000	some amount of water	
Н	22.00111	<u> </u>	Open medium gravel	RI
		000000000	open medicin graver	
Н		00000000		
H		000000000		
Ш	24.00m	1000000000		
-		000000000	Small to medium gravel	RI
5				
~ H				
	26.00-	000000000		
H	26.00m	0000000000	Small around	RI
		000000000000000000000000000000000000000	Small gravel	RI
		DOGGGGGGGGGG		
		00000000000		
	28.00m	000000000000		

Bore or Well No	M36/4891
Well Name	CNR MADDISONS & GOULDS ROAD
Owner	Mr & Ms B N & J A Stevens & Gray



Well Number	M36/4891	File Number	CO6C/06015
Owner	Mr & Ms B N & J A Stevens & Gray	Well Status	Active (exist, present)
Street/Road	CNR MADDISONS & GOULDS ROAD	NZTM Grid Reference	BX23:50117-70000
Locality	ROLLESTON	NZTM X and Y	1550117 - 5170000
Location Description		Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Domestic and Stockwater,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	25.25m	Water Level Count	0
Diameter	150mm	Initial Water Level	7.38m below MP
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	39.15m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	6	Calc Min 80%	9.81m below MP (Estimated)
Aquifer Name	Riccarton Gravel	Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	05 May 1995	Max Tested Yield	8 l/s
Driller	Clemence Drilling Contractors	Drawdown at Max Tested Yield	4 m
Drilling Method	Unknown	Specific Capacity	2.25 l/s/m
Casing Material	UNKNOWN	Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Borelog for well M36/4891

Grid Reference (NZTM): 1550118 mE, 5170001 mN

Location Accuracy: 50 - 300m

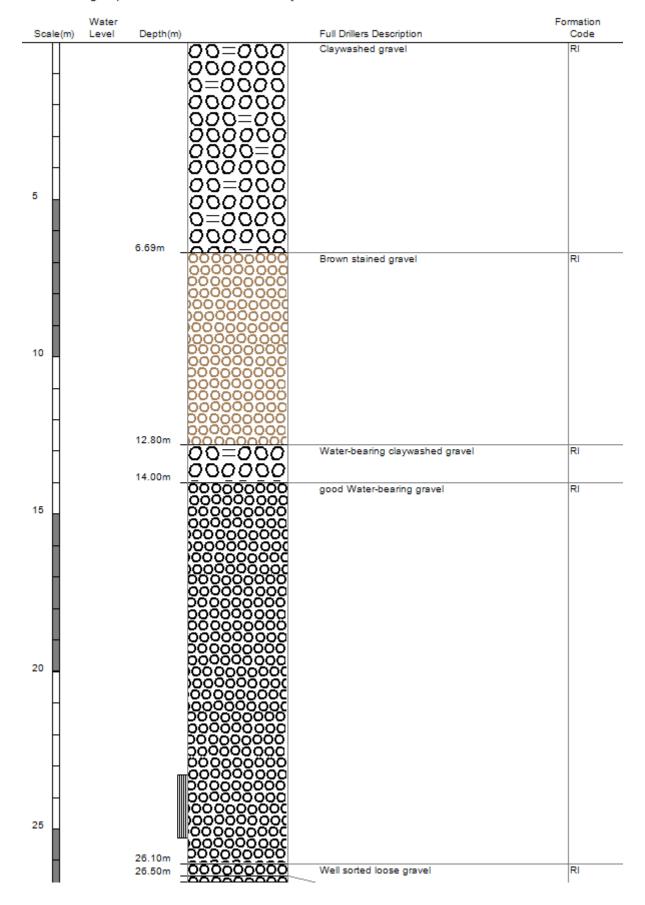
Ground Level Altitude: 39.2 m +MSD Accuracy: < 2.5 m

Driller: Clemence Drilling Contractors

Drill Method: Unknown

Borelog Depth: 26.7 m Drill Date: 05-May-1995





Bore or Well No	M36/5041
Well Name	DUNNS CROSSING ROAD
Owner	KAJENS TRADING DEVELOPMENT LTD



Well Number	M36/5041	File Number	CO6C/10302
Owner	KAJENS TRADING DEVELOPMENT LTD	Well Status	Active (exist, present)
Street/Road	DUNNS CROSSING ROAD	NZTM Grid Reference	BX23:49507-69990
Locality	ROLLESTON	NZTM X and Y	1549507 - 5169990
Location Description		Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Domestic Supply,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	32.00m	Water Level Count	0
Diameter	150mm	Initial Water Level	6.80m below MP
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	40.47m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	10	Calc Min 80%	9.73m below MP (Estimated)
Aquifer Name		Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	01 Feb 1997	Max Tested Yield	5 l/s
Driller	Dynes Road Drilling	Drawdown at Max Tested Yield	13 m
Drilling Method	Cable Tool	Specific Capacity	0.40 l/s/m
Casing Material	STEEL	Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	30	32				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
01 Feb 1997	1	5.1	67.31074	12.8	2

No comments for this well

Borelog for well M36/5041

Grid Reference (NZTM): 1549508 mE, 5169991 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 40.5 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 34.0 m Drill Date: 01-Feb-1997



Coole (m)	Water	Donath (n-)		Full Dillog Description	Formation
Scale(m)	Level	Depth(m)	*** *** *** *** ***	Full Drillers Description	Code
			0.0.0.0.0	Small medium gravel very sandy	
Н			0.0.0.0.0		
		2.00			
Н		2.00m	000000000	Small medium gravel siltbound	
				Sinaii medidin graver siilbound	
Н			000000000		
			000000000		
Н			00000000		
5 📙					
Ĭ		5.40m	000000000		
			0.0.0.0.0	Small medium gravel sand	
			0.0.0.0.0		
			0.0.0.0		
			0.0.0.0.0		
		8.19m	せっさいさいさいり		
		-	000000000	Small medium gravel siltbound, tight	
Н			00000000		
10			000000000		
			000000000		
Н			00000000		
Н			00000000		
		12.80m	00000000		
Н			000000000	Small medium gravel silt wash gravel	
			000000000	brown	
П			00000000		
15					
			000000000		
			000000000		
- 11		16.79m	000000000		
		10.75111	0 • • 0 • 0 • •	Small medium gravel sand traces of	
- 11			0 • 0 • • 0 •	yellow silt	
- H			. 0 0	•	
- 11			• • • • • • • • • • • • • • • • • • • •		
- н			00.0		
II			0.0.0.		
20			.0.0		
		21.00m	.0.0		
Н		21.00111	0.0.0.0.0	Small medium gravel sandy driving	
			1.0.0.0.0.1		
Н			0.0.0.0.0		
			0.0.0.0.0		
П			D•.0.•0•.0•.0		
Ш			.0.0.0.0.		
			0.0.0.0.0		
25		05.40	.0.0.0.0.0		
		25.40m	200000000	Carallaradiona annual tarana altumata	
				Small medium gravel traces silt water	
			000000000		
H			000000000		
- 11					
			000000000		
			000000000		
H			00000000		
. [30.00m			
30		III	 0.0.0.0.0.0	Small medium gravel gravel small	
			0.0.0.0	almost sand	
Н			0.0.0.0.0		

П		32.59m	D.O.O.O.O		
			000000000	Small gravel siltboundwater	
П			00000000	dropping off	
		34.00m			1

Bore or Well No	M36/4449
Well Name	DUNNS CROSSING RD
Owner	TYACK GJ & FR



Well Number	M36/4449	File Number	CO6C/02046
Owner	TYACK GJ & FR	Well Status	Not Used
Street/Road	DUNNS CROSSING RD	NZTM Grid Reference	BX23:49508-69470
Locality	ROLLESTON	NZTM X and Y	1549508 - 5169470
Location Description	LOT 1	Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Irrigation,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	24.20m	Water Level Count	0
Diameter	150mm	Initial Water Level	
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	38.81m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 2.5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	9	Calc Min 80%	9.27m below MP (Estimated)
Aquifer Name	Riccarton Gravel	Aquifer Tests	0
Aquifer Type	Unknown	Yield Drawdown Tests	1
Drill Date	09 Jun 1992	Max Tested Yield	6 l/s
Driller	Dynes Road Drilling	Drawdown at Max Tested Yield	5 m
Drilling Method	Cable Tool	Specific Capacity	1.36 l/s/m
Casing Material		Last Updated	08 Nov 2013
Pump Type	Unknown	Last Field Check	
Water Use Data	No		

Borelog for well M36/4449

Grid Reference (NZTM): 1549508 mE, 5169471 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 38.8 m +MSD Accuracy: < 2.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 24.2 m Drill Date: 09-Jun-1992



Scale(m)	Water Level	Depth(m)		Full Drillers Description	Formation Code
5		8.00m	00000000 00000000 00000000 00000000 0000	Medium-small gravel	
10		10.00m	00000000 00000000 00000000 000000000 0000	Medium-small gravel, very open	
		12.00m	000000000 000000000 000000000 00000000	Medium-small gravel	
		14.00m	000000 000000	Claybound small-medium gravel	
15				Small to large sandy gravel	
20		18.00m	000000000 000000000 00000000 000000000	Medium gravel, Water-bearing	
		22.00m	000000000 000000000 000000000 00000000	Small-medium gravel,clean,open	
		24.00m	000000000 000000000 000000000 00000000	Small to medium gravel,stained	

Bore or Well No	M36/7512	
Well Name	East Maddisons Road	
Owner	Mr & Mrs A S & M M Baxter	



Well Number	M36/7512	File Number	CO6C/21054
Owner	Mr & Mrs A S & M M Baxter Well Status		Active (exist, present)
Street/Road	East Maddisons Road NZTM Grid Reference		BX23:50237-69431
Locality	Rolleston	eston NZTM X and Y	
Location Description		Location Accuracy	50 - 300m
CWMS Zone	Selwyn - Waihora	Use	Domestic and Stockwater,
Groundwater Allocation Zone	Selwyn-Waimakariri	Water Level Monitoring	
Depth	29.00m	Water Level Count	0
Diameter	150mm	Initial Water Level	8.10m below MP
Measuring Point Description		Highest Water Level	
Measuring Point Elevation	34.85m above MSL (Lyttelton 1937)	Lowest Water Level	
Elevation Accuracy	< 5 m	First reading	
Ground Level	0.00m above MP	Last reading	
Strata Layers	6	Calc Min 80%	9.32m below MP (Estimated)
Aquifer Name		Aquifer Tests	0
Aquifer Type		Yield Drawdown Tests	2
Drill Date	01 Dec 2003	Max Tested Yield	5 l/s
Driller	Dynes Road Drilling	Drawdown at Max Tested Yield	10 m
Drilling Method	Cable Tool	Specific Capacity	0.41 l/s/m
Casing Material	STEEL	Last Updated	08 Nov 2013
Pump Type		Last Field Check	
Water Use Data	No		

Screens

Screen No.	Screen Type	Top (m)	Bottom (m)	Slot Size (mm)	Slot Length (mm)	Diameter (mm)	Leader Length (mm)
1	Stainless steel	27	29				

Step Tests

Step Test Date	Step	Yield	Yield GPM	DrawDown	Step Duration
01 Dec 2003	1	1.5	19.7972755	3.65	2
01 Dec 2003	2	4.9	64.6711044	10.36	3

No comments for this well

Borelog for well M36/7512

Grid Reference (NZTM): 1550238 mE, 5169431 mN

Location Accuracy: 50 - 300m

Ground Level Altitude: 34.9 m +MSD Accuracy: < 0.5 m

Driller: Dynes Road Drilling Drill Method: Cable Tool

Borelog Depth: 29.0 m Drill Date: 01-Dec-2003



